

**EPA Superfund  
Record of Decision:**

**KIMBERTON  
EPA ID: PAD980691703  
OU 02  
KIMBERTON BOROUGH, PA  
06/30/1989**

Text:

- \* CIBA PRODUCTS CORPORATION
- \* FIRMENICH INCORPORATED
- \* MONSEY PRODUCTS COMPANY, INC.

CORPORATE RESEARCH ON THESE THREE COMPANIES INDICATES THAT THEY ARE ALL INVOLVED IN INDUSTRIAL PRODUCTION. CIBA PRODUCTS CORPORATION (NOW CIBA-GEIGY CORPORATION) PRODUCES PHARMACEUTICALS, CONTACT LENSES, HERBICIDES AND FUNGICIDES, AND SEEDS. FIRMENICH INCORPORATED IS INVOLVED IN THE PRODUCTION OF CHEMICALS AND SYNTHETIC PERFUMES AND MONSEY PRODUCTS COMPANY, INC. PRODUCES ASPHALT, COAL TAR ROOFING, DRIVEWAY SEALER AND AUTOMOTIVE UNDERCOATINGS.

DURING THE PERIOD OF SITE OWNERSHIP BY A PREDECESSOR OF CIBA-GEIGY (CIBA PRODUCTS COMPANY) FROM 1947 TO 1959, A SERIES OF EIGHT LAGOONS WERE OPERATED ON THE SITE. THESE LAGOONS, WHICH RECEIVED VARIOUS RESIDUES FROM THE MANUFACTURING OPERATIONS AT THAT TIME, WERE ULTIMATELY ABANDONED AND CLOSED. SEVERAL OF THESE LAGOONS WERE SUBSEQUENTLY BACKFILLED OR OTHERWISE REGARDED.

VOLATILE ORGANIC COMPOUNDS WERE FIRST DETECTED IN THE GROUNDWATER AT KIMBERTON DURING ROUTINE WATER QUALITY TESTING OF A PRIVATE WELL ON THE MONSEY PROPERTY BY CCHD IN AUGUST 1981. SUBSEQUENT TESTING OF 24 ADDITIONAL LOCAL WELLS BY PADER FROM JANUARY THROUGH MARCH OF 1982 DETECTED LEVELS OF A NUMBER OF VOLATILE ORGANIC COMPOUNDS IN TWELVE OF THE WELLS SAMPLED.

IN RESPONSE TO THE GROUNDWATER CONTAMINATION IN THE KIMBERTON, EPA CONDUCTED A FIELD INVESTIGATION REVEALED THE PRESENCE OF ORGANIC CHEMICALS, INCLUDING TRICHLOROETHYLENE (TCE) AND TRANS 2-DICHLOROETHYLENE (DCE), IN LOCAL GROUNDWATER, SURFACE WATER, AND SOILS SAMPLED FROM THE SITE. AS A RESULT OF THE FIELD INVESTIGATION TEAM'S (FIR) REPORT OF JULY 23, 1982, THE SITE WAS PLACED ON THE NPL BY THE EPA.

INVESTIGATIONS CONDUCTED BY CIBA-GEIGY AND MONSEY SINCE THE INITIAL DETECTION OF ORGANIC COMPOUNDS IN WATER AND SOIL SAMPLES HAVE INDICATED A GRADUAL RELEASE OF VOLATILE ORGANIC COMPOUNDS THROUGH THE SUBSURFACE TO THE LOCAL WATER TABLE. THESE COMPOUNDS GRADUALLY MIGRATE WITH THE LOCAL GROUNDWATER GRADIENT AND DISCHARGE TO SURFACE WATERS TO THE NORTH AND EAST IN THE VILLAGE OF KIMBERTON. VOLATILE ORGANIC COMPOUNDS HAVE BEEN DETECTED IN A NUMBER OF PRIVATE WELLS IN AN APPARENT DOWNGRAIENT DIRECTION FROM THE CURRENT MONSEY PROPERTY. LIMITED, LOW LEVEL SURFACE WATER CONTAMINATION HAS ALSO BEEN DETECTED IN LOCAL RECEPTOR STREAMS.

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#### IV. ENFORCEMENT HISTORY

PAST DISPOSAL PRACTICES, INVOLVING HAZARDOUS SUBSTANCES, WHICH OCCURRED BETWEEN 1947 TO 1959, HAVE RESULTED IN GROUNDWATER AND SOIL CONTAMINATION AT THIS SITE. IN SEPTEMBER 1986 PADER, WHICH IS THE LEAD AGENCY FOR ENFORCEMENT FOR THIS SITE, SENT TO CIBA-GEIGY AND MONSEY LETTERS INFORMING THESE COMPANIES THAT THEY WERE POTENTIAL RESPONSIBLE PARTIES (PRPS) AND LIABLE FOR THE CONTAMINATION AT THIS SITE. IN ADDITION, THESE LETTERS SOUGHT THEIR PARTICIPATION IN THE REMEDIAL INVESTIGATION AND FEASIBILITY STUDIES (RI/FS) PROCESS. BOTH COMPANIES AGREED TO CONDUCT A RI/FS AT THIS SITE, TO PROVIDE AN ALTERNATE SOURCE OF DRINKING AND CONTACT WATER TO THOSE RESIDENTIAL AND COMMERCIAL LOCATIONS WHOSE WATER SUPPLY WAS CONTAMINATED BY THE SITE, AND TO CONTINUE TO MONITOR SPECIFIED LOCATIONS FOR THE IDENTIFIED CONTAMINANTS. THESE PROVISIONS WERE FORMALLY DOCUMENTED IN TWO CONSENT ORDER AND AGREEMENTS WITH PADER IN 1986 AND 1987.

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## V. SITE CHARACTERISTICS

### A. GEOLOGY/HYDROGEOLOGY

#### 1. SITE GEOLOGY

THERE ARE TWO PREDOMINANT GEOLOGIC FORMATIONS IN KIMBERTON: A GRAPHITIC GNEISS WHICH IS A METAMORPHIC ROCK OF PRECAMBRIAN AGE DESCRIBED AS A MEDIUM-GRAINED GNEISS AND SCHIST CHARACTERIZED BY THE PRESENCE OF GRAPHITE; THE OTHER, THE STOCKTON FORMATION, A SEDIMENTARY UNIT OF TRIASSIC AGE AND CONSISTING LOCALLY OF GRAY AND RED SILTSTONES, RED

SHALES, FINE TO MEDIUM GRAY AND REDDISH GRAY SANDSTONES AND ARKOSIC SANDSTONES (FIGURE 4). THE SHALES AND SILTSTONES ARE SOMETIMES THINLY INTERBEDDED WITH IMPURE CARBONATE ROCK. THE CONTACT ZONE BETWEEN THE GRAPHITIC GNEISS AND THE STOCKTON FORMATION LIES TO THE NORTHEAST OF COLDSTREAM ROAD AND IN AN APPROXIMATE WNW TO ESE ORIENTATION. IT IS FOR THE MOST PART, ILL-DEFINED AND HAS BEEN MAPPED USING DRILLING LOGS OF THE MONITORING WELLS INSTALLED BY GROUNDWATER TECHNOLOGY INC., (GTI) (A CONTRACTOR EMPLOYED BY CIBA-GEIGY). AS DETERMINED THROUGH DRILLING OF THE MONITORING WELLS, THE GRAPHITIC GNEISS HAS UNDERGONE SIGNIFICANT MECHANICAL AND CHEMICAL BREAKDOWN (WEATHERING).

THE WEATHERING HAS WORKED PROGRESSIVELY DOWNWARD FROM THE SURFACE, CREATING AN UPPER UNCONSOLIDATED WEATHERED ZONE OF DECOMPOSED ROCK AND SOIL WHICH GRADES VERTICALLY INTO A CRUMBLY, GRAVEL-LIKE MATERIAL WHERE PIECES OF SAND-TO BOULDER-SIZE ROCKS REMAIN IN PLACE IN A CLAYEY MATRIX. THE WEATHERED ZONE WAS FOUND TO BE BETWEEN 50 FEET AND 75 FEET IN THICKNESS, EXCEPT IN ONE AREA WHERE IT WAS ONLY 30 FEET THICK. GROUNDWATER IS LOCATED ALMOST EXCLUSIVELY WITHIN THE WEATHERED PORTION OF THE GRAPHITIC GNEISS (LOCALLY ON THE MONSEY PROPERTY).

WEATHERING WITHIN THE STOCKTON FORMATION WAS FAR LESS SEVERE WITH THE WEATHERED LAYER GENERALLY RANGING IN THICKNESS FROM 5 FEET TO 15 FEET (FIGURE 5).

#### 2. HYDROGEOLOGY

THE HYDROGEOLOGY OF THE KIMBERTON AREA IS TYPICAL OF THE CHESTER COUNTY REGION AS A WHOLE. WATER LEVELS FLUCTUATE IN RESPONSE TO SEASONAL PRECIPITATION AND EVAPOTRANSPIRATIONAL TRENDS. THE WATER TABLE CLOSELY MIMICS TOPOGRAPHY, WITH THE DOMINANT RECHARGE AREAS LYING IN THE HIGHER ELEVATIONS AND DISCHARGE ZONES CONSIST OF SPRINGS AND STREAMS AT LOW ELEVATIONS.

WITHIN THE AREA OF CONCERN, WATER TABLE CONDITIONS EXIST WITHIN TWO CONTRASTING (LITHOLOGICALLY DERIVED) WATER-BEARING UNITS: THE METAMORPHIC GRAPHITIC GNEISS (ENCOMPASSING THE MONSEY PROPERTY) AND THE STOCKTON FORMATION (COMPRISING THE DOWNTOWN KIMBERTON AREA AND SURROUNDING PROPERTIES. AS DISCUSSED PREVIOUSLY, THE GRAPHITIC GNEISS IS HIGHLY WEATHERED TO A MEDIAN DEPTH OF 50 FEET TO 75 FEET. THE UNCONSOLIDATED UPPER PART OF THE GRAPHITIC GNEISS GENERALLY HAS MODERATE TO LOW PERMEABILITY, BUT CONTAINS A CONSIDERABLE AMOUNT OF WATER IN STORAGE. BELOW THE UNCONSOLIDATED ZONE THE ROCK IS GENERALLY SOLID; HOWEVER, SOME MINERALS ARE HEAVILY WEATHERED, PARTICULARLY ALONG FRACTURES. PERMEABILITY AND STORAGE CAPACITY OF THE SOLID FRACTURED ROCK GENERALLY DECREASE WITH DEPTH AS THE DEGREE OF WEATHERING DECREASES. THE HIGHEST PERMEABILITY PROBABLY OCCURS WHERE THE UNCONSOLIDATED AND SOLID ROCK MERGE. IN THIS TRANSITIONAL AREA, OPENINGS IN ROCK ARE FORMED OR ENLARGED BY THE WEATHERING PROCESS. STORAGE CAPACITY, HOWEVER, IS LOW BECAUSE THE ROCK HAS LIMITED POROSITY.

GROUNDWATER MOVEMENT THROUGH THE GNEISS TENDS TO MIGRATE IN RESPONSE TO ELEVATIONAL CHANGES IN THE WATER TABLE (FIGURE 6). THE SUBSURFACE ZONE OF PRIMARY MOVEMENT IS NOTED WITHIN THE HIGHLY WEATHERED AND FRACTURED UPPER PORTION OF THE GNEISS. DEEPER WATER-BEARING ZONES ARE REPORTED TO OCCUR AT FRACTURED TRACES (DOMINANTLY VERTICAL TO SUBVERTICAL IN PROFILE), AND GENERALLY RECEIVE RECHARGE VIA VERTICAL INFILTRATION FROM

THE OVERLYING HORIZONS. LOCAL WELL YIELDS WITHIN THE GRAPHITIC GNEISS RANGE FROM 4- 25 GALLONS PER MINUTE(GPM) IN WELLS WHICH DRAW WATER FROM THE WEATHERED ZONE, WITH OVER 200 GPM REPORTED IN SEVERAL OF THE DEEPER WELLS (EXISTING MONSEY WELLS # 1- 4) WHICH MAY PENETRATE DEEPER FRACTURES WITHIN THE BEDROCK GNEISS. GROUNDWATER MOVEMENT LOCALLY WITHIN THE GRAPHITIC GNEISS AND SUSPECT FRACTURE ZONES ARE REGIONALLY INTERPRETED IN A NORTH-NORTH EASTERLY DIRECTION FROM THE MONSEY PROPERTY AND DOWNTOWN KIMBERTON AREA, TOWARD FRENCH CREEK.

THE STOCKTON FORMATION GENERALLY CONSISTS OF INTERBEDDED SANDSTONES, SILTSTONES, AND SHALES. THE INTERBEDDING AND FRACTURING HAS CAUSED EXTREMELY ANISOTROPIC AND HETEROGENEOUS HYDRAULIC CHARACTERISTICS ASSOCIATED WITH THIS FORMATION. GROUNDWATER IS LARGELY TRANSMITTED ALONG BEDDING PLANES, FRACTURES AND JOINTS. WATER WITHDRAWAL RATES NOTED FOR WELLS LOCALLY PENETRATING THE STOCKTON FORMATION HAVE YIELDED BETWEEN 2 AND 20 GPM, DEPENDING UPON THE NATURE, LOCATION, AND DEPTH OF WELLS.

#### A. GROUNDWATER

GROUNDWATER ELEVATIONS OF MONITORING WELLS BOTH ON AND OFF THE SITE WERE MEASURED FROM THE TOP OF SECURE CASINGS USING ELECTRICAL WATER LEVEL DETECTORS (FIGURE 7). FIELD SURVEYS WERE PERFORMED TO DETERMINE ACCURATELY THE HORIZONTAL COORDINATES AND VERTICAL ELEVATIONS (TIED INTO USGS BENCH MARK DATUM LOCATED IN DOWNTOWN KIMBERTON) OF WELL CASINGS. RESPECTIVE FIELD DATA TRANSPOSED ONTO PREPARED BASE MAPS PROVIDED A BASIS FOR THE FOLLOWING INTERPRETATIVE CORRELATIONS RELATIVE TO GROUNDWATER MOVEMENT WITHIN THE MONSEY PROPERTY AND ADJACENT KIMBERTON AREA:

- \* THE OCCURRENCE OF GROUNDWATER IS UNDER WATER TABLE CONDITIONS AT DEPTHS RANGING FROM APPROXIMATELY 2 FEET TO 50 FEET BELOW LAND SURFACE.
- \* WATER TABLE ELEVATIONS MIMICKING A SUBDUED VERSION OF SURFACE TOPOGRAPHY: INCREASED GROUNDWATER ELEVATIONS CORRELATING TO AREAS OF HIGH TOPOGRAPHIC ELEVATIONS SUCH AS RIDGES AND KNOLLS; REDUCED GROUNDWATER ELEVATIONS OCCURRING DOMINANTLY IN TOPOGRAPHICALLY LOW AREAS CHARACTERIZED BY STREAMS, CREEKS, AND SPRINGS.
- \* LOCAL GROUNDWATER RECHARGE TO THE MONSEY PROPERTY AND ADJACENT KIMBERTON AREA OCCURS FROM BOTH VERTICAL INFILTRATION ONTO RELATED SURFACE AREAS AND DIRECTIONALLY FROM ADJACENT TOPOGRAPHIC HIGH AREAS; DOMINANTLY FROM THE SOUTH OF ROUTE 113, FROM THE NORTH OF HARES HILL ROAD, AND FROM THE EAST OF DOWNTOWN KIMBERTON (UP TOPOGRAPHIC GRADIENT FROM THE EASTERLY DIRECTION OF THE UNNAMED CREEK/MARSH AREA).
- \* GROUND WATER DISCHARGE LOCALLY OCCURS THROUGH SURFACE SPRINGS, SEEPS, AND CREEKS TO SMALL STREAMS LOCATED WITHIN LOCAL TOPOGRAPHIC LOWS. ONE SUCH DISCHARGE AREA IS LOCATED ADJACENT TO THE NORTHWEST BOUNDARY OF MONSEY'S PROPERTY AS AN UNNAMED CREEK FLOWING TO THE NORTHEAST THROUGH THE CENTER OF KIMBERTON (STREAM "A"; FIGURE 8). ANOTHER SUCH DISCHARGE AREA EXISTS TO THE NORTHEAST OF THE MONSEY PROPERTY AS A MINOR UNNAMED CREEK FLOWING TO THE NORTHWEST AND EVENTUALLY CONVERGING WITH STREAM "A" (STREAM "B"; FIGURE 8). A THIRD LOCAL GROUNDWATER DISCHARGE OCCURS TO THE SOUTHEAST OF THE MONSEY PROPERTY, AGAIN AS AN UNNAMED MINOR CREEK IN THIS CASE FLOWING GENERALLY SOUTHEAST FROM THE SITE AREA (STREAM "C"; FIGURE 8).
- \* GROUND WATER GRADIENT AND GROUND WATER FLOW ARE DIRECTIONALLY CONTROLLED IN RESPONSE TO ELEVATIONAL CHANGES IN THE WATER TABLE. UNDER NATURAL, NON-PUMPING CONDITIONS, THE PREDOMINANT GROUND WATER GRADIENT FROM THE MONSEY PROPERTY RANGES DIRECTIONALLY FROM THE NORTHWEST CLOCKWISE THROUGH THE SOUTHEAST, TOWARD THE ABOVE NOTED GROUNDWATER DISCHARGE ZONES.

- \* PHYSIOCHEMICAL PARAMETERS MEASURED FROM AREA MONITORING WELLS AS BASELINE WATER QUALITY CHARACTERISTICS (PH, TDS, AND CHLORIDE) APPEAR TO FALL WITHIN BACKGROUND RANGES.

## B. SURFACE WATER

THE LOCAL SURFACE WATERS CAN BE DIVIDED INTO THREE UNNAMED STREAMS (FIGURE 8) EMANATING WITHIN AND/OR FLOWING THROUGH THE CENTRAL KIMBERTON AREA. FOR CLARITY, THE STREAMS HAVE BEEN DESIGNATED AS FOLLOWS:

- \* STREAM A: A SMALL, PERMANENT STREAM (THE PRIMARY STREAM IN THE CENTER OF KIMBERTON) FLOWING GENERALLY SOUTH TO NORTH, ADJACENT TO THE NORTH-WESTERN BOUNDARY OF THE MONSEY PROPERTY. THIS STREAM IS PRIMARILY SPRING FED WEST OF THE SITE FROM SOURCES AT AND UPSTREAM OF THE GNEISS/CLASTIC CONTACT ZONE. ESTIMATED AVERAGE STREAM FLOW IN THIS AREA RANGES SEASONALLY FROM 0.5 TO 4 CUBIC FEET PER SECOND (CFS). A SIGNIFICANT INCREASE IN STREAM VOLUME OCCURS UPON ITS CONFLUENCE WITH THE OUTFALL FROM GOTWALS PONDS. ESTIMATED FLOW DOWNSTREAM OF THIS CONFLUENCE RANGES FROM 8 TO 12 CFS.
- \* STREAM B: AN APPARENT MINOR INTERMITTENT STREAM WHICH APPEARS TO ORIGINATE FROM A SPRING NEAR THE LOCATION OF THE KIMBERTON TOWN DUMP AS OF 1950. THE TERMINUS OF THIS STREAM IS NOT VISIBLE ON AERIAL PHOTOGRAPHS BUT IT IS BELIEVED TO BECOME CONFLUENT WITH STREAM A. ESTIMATED FLOW DOWN THE HEADWATERS IS 0.1 TO 0.5 CFS. DOWNSTREAM FLOW HAS NOT BEEN OBSERVED BUT IS NOT ANTICIPATED TO BE SIGNIFICANT.
- \* STREAM C: A TRIBUTARY OF FRENCH CREEK WHICH FLOWS SOUTH OF THE INTERSECTION OF ROUTE 113 AND COLD STREAM ROAD. THIS STREAM DERIVES A MAJOR VOLUME OF ITS FLOW FROM TOPOGRAPHICALLY HIGH AREAS TO THE SOUTH OF THE STUDY AREA. STREAM FLOW APPEARS TO BE INTERMITTENT UPSTREAM OF COLD STREAM ROAD. HOWEVER, A SIGNIFICANT INCREASE IN STREAM FLOW RESULTS FROM A MAJOR SPRING LOCATED ROUGHLY 300 FEET DOWNSTREAM FROM COLD STREAM ROAD WITH FLOWS ESTIMATED AT 0.5 TO 2 CFS.

## B. EXTENT OF CONTAMINATION

### 1. DRUM REMOVAL

IN MID 1982 CIBA-GEIGY AND MONSEY SUPERVISED THE EXCAVATION AND REMOVAL OF 57, 55-GALLON DRUMS FROM AN ABANDONED, ON-SITE SEPTIC SYSTEM FORMERLY USED TO SERVE THE PLANT'S WASTEWATER STORAGE NEEDS. THESE DRUMS CONTAINED OFF-SPECIFICATION ASPHALTIC MATERIALS WHICH HAD BEEN USED AS PARTIAL BACKFILL FOR THE COLLAPSED SEPTIC PIT SOMETIME EARLIER. THE DRUM REMOVAL PROGRAM, CONDUCTED IN CONJUNCTION WITH PADER, CONSISTED OF REMOVAL OF ALL DRUMS FROM THE PIT AREA, PROCUREMENT OF SAMPLES FROM FIVE REPRESENTATIVE DRUMS FOR ANALYSIS, PROCUREMENT OF POST-EXCAVATION SOIL SAMPLES FOR ANALYSIS, AND APPRAISAL OF POSSIBLE CASUAL RELATIONSHIP BETWEEN THE BURIED DRUMS AND THE GROUNDWATER CONTAMINATION.

THE DRUM EXCAVATION, REMOVAL, AND DISPOSAL PROGRAM WAS SUCCESSFULLY COMPLETED IN NOVEMBER, 1982. SOIL SAMPLES AT A LEVEL BENEATH THE EXCAVATION FLOOR INDICATED-NO EXTENSIVE MIGRATION OF ORGANIC COMPOUNDS FROM THE AREA.

THE PRELIMINARY HYDROGEOLOGIC ASSESSMENT CONDUCTED BY CIBA-GEIGY AND MONSEY RECOMMENDED A MORE DEFINITIVE OFF-SITE INVESTIGATION OF THE GROUNDWATER SURROUNDING THE SITE. THIS IS CURRENTLY BEING COMPLETED.

### 2. LAGOON EXCAVATION

AS A RESULT OF SOIL SAMPLING CONDUCTED DURING PRELIMINARY SITE ASSESSMENT ACTIVITIES, THREE AREAS WERE IDENTIFIED WITHIN THE MONSEY PROPERTY WITH RELATIVELY HIGH LEVELS OF ORGANIC COMPOUND

CONTAMINATION. STUDY OF AVAILABLE HISTORIC AERIAL PHOTOGRAPHS CONFIRMED THAT THE THREE AREAS WERE FORMER TREATMENT LAGOONS. THESE THREE AREAS, IDENTIFIED BY GTI AS LAGOONS 6, 7, AND 9, WERE CHARACTERIZED BY MATERIALS OF SIMILAR CHEMICAL COMPOSITION AND PHYSICAL APPEARANCE.

UPON REVIEW OF THIS INFORMATION AND AT THE REQUEST OF PADER, A PROGRAM WAS UNDERTAKEN BY THE CIBA-GEIGY AND MONSEY TO EXCAVATE, REMOVE, AND DISPOSE OF SOILS FROM THE THREE FORMER LAGOON AREAS AS PART OF A SITE REMEDIAL ACTION PROGRAM.

THE EXCAVATION PROGRAM WAS FINALIZED DURING AUGUST AND EARLY SEPTEMBER 1984. ACTUAL SITE EXCAVATION WAS INITIATED ON SEPTEMBER 17 AND COMPLETED ON SEPTEMBER 25. SITE BACKFILLING AND RESTORATION WERE COMPLETED ON OCTOBER 8.

UPON COMPLETION OF THE EXCAVATION PROGRAM ON SEPTEMBER 25, 1984, A TOTAL OF 143 TRUCKLOADS REPRESENTING APPROXIMATELY 2,050 CUBIC YARDS OF MATERIAL. ALL EXCAVATED MATERIALS WERE CONFIRMED AS RECEIVED AT THE LICENSED TSD FACILITY OPERATED BY CECOS INTERNATIONAL, INC., IN NIAGARA FALLS, NEW YORK.

EXCAVATION LIMITS WERE DETERMINED IN THE FIELD BY VISUAL ASSESSMENT AND THROUGH PHOTOIONIZER MEASUREMENTS PROCURED ALONG THE BASE AND SIDES OF EACH EXCAVATION. UPON COMPLETION OF THE EXCAVATION PROGRAM, REPRESENTATIVE SOIL SAMPLES WERE OBTAINED FROM PIT FLOORS AND WALLS IN THE PRESENCE OF PADER OR EPA, AND SAMPLE SPLITS WERE PROVIDED TO PADER FOR ANALYSIS. SUBSEQUENT TO THIS PROCESS, MARKER HORIZONS WERE PLACED IN EACH EXCAVATION AND BACKFILLING WAS INITIATED. SITE BACKFILLING AND RESTORATION WERE INITIATED ON SEPTEMBER 26, 1984, AND COMPLETED ON OCTOBER 8, 1984, WITH THE APPLICATION OF VEGETATIVE COVER MATERIAL.

THE COMBINATION OF VISUAL ASSESSMENT, LOW-LEVEL RECORDED PHOTOIONIZER READINGS, AND ANALYTICAL RESULTS OF POST-EXCAVATION SOIL SAMPLES ALL INDICATE THAT THE LAGOON EXCAVATION REMEDIAL ACTION PROGRAM WAS SUCCESSFUL IN REMOVING POTENTIAL SOURCE MATERIALS OF GROUND WATER CONTAMINATION FROM THE SITE. DATA OBTAINED DURING AND SUBSEQUENT TO THE EXCAVATION PROGRAM INDICATE A MINIMUM OF 95 PERCENT REDUCTION IN TOTAL VOLATILE ORGANIC COMPOUND CONCENTRATION IN THESE FORMER LAGOONS.

TO MORE COMPLETELY DEFINE THE REPRESENTATIVE CONCENTRATIONS OF THE CHEMICAL COMPOUNDS WITHIN EACH OF THE FORMER LAGOON AREAS, A PROGRAM OF DISCRETE SOIL SAMPLING WAS IMPLEMENTED FROM JANUARY 11-19, 1988. SOIL SAMPLES WERE COLLECTED FROM FORMER LAGOONS 1, 2, 3, 4, 8, AND AREA 5 IN ACCORDANCE WITH THE WORK PLAN FOR COMPLETION OF THE REMEDIAL INVESTIGATION AND FEASIBILITY STUDY; KIMBERTON, PENNSYLVANIA (RI WORK PLAN) (JULY 1987). LOCATIONS OF THE FORMER LAGOONS AND SAMPLE POINTS ARE DEPICTED IN FIGURE 9.

#### CONCLUSIONS FROM THE LAGOON INVESTIGATION

- \* THE AVERAGE ACCUMULATION OF SILTY CLAY OVERBURDEN, OBSERVED BENEATH THE FORMER LAGOON AREAS, WAS APPROXIMATELY 8 FEET IN THICKNESS. IN LIGHT OF THE FACT THAT NO DISTINCT LITHOLOGIC DIFFERENTIATION WAS OBSERVED BETWEEN LAGOON FILL MATERIAL AND THE INDIGENOUS OVERBURDEN, IT IS ASSUMED THAT THE FORMER LAGOONS WERE FILLED BY REGRADING ADJACENT SOILS. IN ALL CASES, DIRECTLY BENEATH THE SILTY CLAY HORIZON A DISTINCT GRAPHITIC GNEISS SAPROLITE WAS ENCOUNTERED.
- \* FORMER LAGOON 1 WAS COMPRISED OF APPROXIMATELY 5 TO 7 FEET OF SILTY CLAY OVERLYING THE WEATHERED GRAPHITIC GNEISS. WITH THE EXCEPTION OF THE 8 TO 10 FOOT SAMPLE INTERVAL OF BORING C (10.0 PPM), NO SIGNIFICANTLY ELEVATED FIELD OVA READINGS WERE OBSERVED.
- \* FORMER LAGOON 2 CONTAINED APPROXIMATELY 7 TO 8 FEET OF OVERBURDEN. DUE TO THE DETECTION OF ELEVATED ORGANIC VAPOR

ANALYZER OVA READINGS IN SOIL BORING B (50 PPM), THIS BORING WAS ADVANCED APPROXIMATELY 3 TO 4 FEET BELOW THE LAGOON/SAPROLITE INTERFACE, AT WHICH POINT FIELD OVA READINGS HAD DECREASED TO 9 PPM.

- \* FORMER LAGOON 3 WAS CHARACTERIZED BY THE GREATEST ACCUMULATION OF SILTY CLAY OVERBURDEN, AVERAGING 11 FEET IN THICKNESS. NO ELEVATED FIELD OVA READINGS WERE OBSERVED DURING THE SOIL BORING PROGRAM. IT IS PRESENTLY BELIEVED THAT A SEMI-CONTINUOUS LAYER OF DARK GRAY BRITTLE MATERIAL EXIST AT A DEPTH OF APPROXIMATELY 6 FEET, PROXIMAL TO BORINGS C AND E.
- \* FORMER LAGOON 4 DEMONSTRATED 6 TO 8 FEET OF OVERBURDEN, CHARACTERIZED BY THE ABSENCE OF ELEVATED FIELD OVA READINGS. A SEMI-CONTINUOUS ANOMALOUS LAYER (1/4 INCH THICK DARK GRAY BRITTLE LAYER) WAS ENCOUNTERED AT A DEPTH OF APPROXIMATELY 6 FEET BELOW BORING LOCATIONS E AND D.
- \* AREA 5 DEMONSTRATED THE PRESENCE OF A DISTINCT TOP SOIL HORIZON AND A 7 TO 8 FOOT. THICK SILTY CLAY UNIT OVERLYING THE GRAPHITIC GNEISS SAPROLITE. AN ANOMALOUS OCCURRENCE OF A 3/4-INCH THICK GRAY/BLUE BRITTLE LAYER WAS OBSERVED NEAR THE SURFACE IN BORING B. NO ELEVATED FIELD OVA READINGS WERE OBSERVED DURING THE SOIL BORING PROGRAM.
- \* FORMER LAGOON 8, UNLIKE THE OTHER LAGOON AREAS, HAS NOT BEEN COMPLETELY REGRADED AND IS, THEREFORE CHARACTERIZED BY A DISTINCT DEPRESSION WITH THE GROUND SURFACE. APPROXIMATELY 5 TO 7 FEET OF OVERBURDEN WAS ENCOUNTERED ABOVE THE SAPROLITE HORIZON IN THIS AREA. WITH THE EXCEPTION OF THE FOUR TO SIX FOOT SAMPLE INTERVAL OF BORING C (7.2 PPM) NO ELEVATED OVA READINGS WERE OBSERVED DURING THE SAMPLING PROGRAM. A 3-INCH THICK "BEIGE PASTE" LAYER WAS OBSERVED CONSISTENTLY AT A DEPTH OF THREE TO FOUR INCHES BELOW GRADE IN BORINGS A, B, AND E.
- \* WITH THE EXCEPTION OF FORMER LAGOONS 1 AND 2, ONLY TRACE CONCENTRATIONS OF A LIMITED NUMBER OF TARGET COMPOUNDS LIST (TCL) VOLATILES WERE DETECTED IN LAGOON SOIL SAMPLES.
- \* LAGOON 2 WAS CHARACTERIZED BY THE PRESENCE OF FOUR VOLATILE COMPOUNDS: TRICHLOROETHENE, CHLOROBENZENE, ETHYLBENZENE AND XYLENES AT CONCENTRATIONS OF 410 UG/KG, (MICROGRAM/KILOGRAM) 96 UG/KG, 11 UG/KG, AND 25 UG/KG, RESPECTIVELY.
- \* FORMER LAGOON 1 DEMONSTRATED THE PRESENCE OF TRICHLOROETHENE AT A CONCENTRATION OF 70 UG/KG AND CHLOROBENZENE AT 9 UG/KG.
- \* WITH THE EXCEPTION OF AREA 5, SIX TCL SEMIVOLATILE COMPOUNDS WERE RECORDED IN VARIOUS COMBINATIONS AT TRACE TO LOW CONCENTRATIONS IN THE FORMER LAGOON AREAS.
- \* AREA 5 WAS CHARACTERIZED BY THE PRESENCE OF EIGHT TCL SEMIVOLATILE COMPOUNDS RANGING IN ESTIMATED CONCENTRATIONS FROM A LOW 290 UG/KG (2-XETHYLPHENOL) TO A HIGH OF 5700 UG/KG (PHENOL).

### 3. GROUNDWATER CONTAMINATION

THE HIGHEST CONCENTRATIONS OF VOLATILE ORGANIC COMPONENTS (VOC) MONITORING WELLS WERE FOUND IN THOSE ADJACENT TO, AND DIRECTLY DOWN HYDRAULIC GRADIENT FROM THE SITE OF THE FORMER LAGOONS. ALTHOUGH WELLS #5, #14, AND #21 ARE REASONABLY CLOSE TO WELLS HAVING HIGH VOC CONCENTRATIONS (WELLS #7, #16 AND #13, RESPECTIVELY) THEY REMAIN UNCONTAMINATED BECAUSE OF THEIR UPWATER TABLE GRADIENT POSITIONS WITHIN THE HYDRAULIC REGIME. VOC'S WERE IN DETECTED IN SHALLOW GROUND WATER WEST OF THE LAGOON AREAS (AT WELL #28) BUT BASED ON WATER TABLE GRADIENT MAPS AND CHEMICAL ANALYSIS OF SAMPLES FROM WELLS #34 AND #35, IN

ADDITION TO THE FITZSIMMON WELL (NO VOC DETECTED IN ALL THREE WELLS),  
GROUND WATER IN THIS ARE APPEARS TO BE DISCHARGING TO STREAM A,  
NORTHEAST OF THE FITZSIMMONS PROPERTY (FIGURE 12 AND TABLES 1 AND 2).



TABLE 2

COMPARISON OF ANALYTICAL  
DATA FROM JUNE 23-26, 1986  
AND JUNE 21-27, 1988  
SAMPLING PERIODS FOR  
SELECTED WELLS.

WELL #	TOTAL VOC (PPB) JUNE 23 - 26, 1986	TOTAL VOC (PPB) JUNE 21 - 27, 1988
5	7	ND
8	9	ND
11	1730	2180
13	1222	1210
14	ND	ND
16	606	1343
18	ND	ND
19	ND	ND*
21	ND	ND
23	70	40

ND - NON DETECTABLE

\* SAMPLE COLLECTED MARCH 28-31, 1988

CONCLUSIONS FROM THE GROUNDWATER INVESTIGATION (FIGURES 10 THROUGH 13)

- \* THE KIMBERTON SITE IS CHARACTERIZED BY THE OCCURRENCE OF TWO DISTINCT GEOLOGICAL UNITS, THE STOCKTON FORMATION AND THE GRAPHITIC GNEISS, WHICH HAVE DIFFERENT HYDROLOGICAL PROPERTIES.
- \* GROUNDWATER OCCURS UNDER WATER TABLE CONDITIONS AT DEPTHS RANGING FROM 2 FEET TO 50 FEET BELOW GRADE. WATER TABLE ELEVATIONS GENERALLY MIMIC LOCAL TOPOGRAPHIC EXPRESSION BUT AT LESSER GRADIENTS.
- \* LOCAL GROUNDWATER RECHARGE OCCURS DOMINANTLY AS DIRECTIONAL RECHARGE FROM ADJACENT TOPOGRAPHIC HIGH AREAS AND ALSO VIA SURFACE INFILTRATION OF PRECIPITATION ONTO RELATED AREAS.
- \* GROUNDWATER DISCHARGE OCCURS VIA SURFACE SPRINGS, CREEKS AND STREAMS IN LOW TOPOGRAPHIC AREAS. THE DOMINANT LOCAL GROUND WATER DISCHARGE ZONE IS MANIFESTED BY THE CREEK TO THE NORTH OF THE MONSEY PROPERTY (DESIGNATED STREAM B). STREAM B LIES TO THE EAST OF THE MONSEY PROPERTY AND CONVERGES WITH THE ABOVE NOTED ZONE SLIGHTLY TO THE NORTH OF KIMBERTON.
- \* GROUND WATER GRADIENT AND FLOW WITHIN THE SITE AREA ARE DIRECTIONALLY CONTROLLED BY ELEVATIONAL CHANGES IN PRESSURE HEAD. UNDER NATURAL, NON-PUMPING CONDITIONS, THE DIRECTION OF GROUND WATER FLOW IS ORIENTED TOWARD THE NORTHEAST, NORTH AND NORTHWEST TOWARD THE ABOVE NOTED LOCAL GROUND WATER DISCHARGE ZONES.
- \* AN UPWARD HYDRAULIC GRADIENT HAS BEEN DETERMINED IN DISCHARGE AREAS TO THE NORTH OF THE SITE ALONG STREAM A. A DOWNWARD HYDRAULIC GRADIENT HAS BEEN DETERMINED IN THE RECHARGE AREA TO THE EAST OF THE SITE.
- \* TRANSMISSIVITY AND STORAGE COEFFICIENT VALUES OF THE GRAPHITIC GNEISS IN THE FORMER LAGOON AREA WERE DETERMINED TO BE ON THE ORDER OF 17,000 GPD/FT AND .01, RESPECTIVELY.
- \* HYDRAULIC PROPERTIES OF THE GRAPHITIC GNEISS ARE HIGHLY DIRECTIONAL. INCREASED HYDRAULIC COMMUNICATION IN THE NORTH TO NORTHEAST DIRECTION IS ATTRIBUTED TO FRACTURING AND

PREFERENTIAL WEATHERING IN THAT DIRECTION.

- \* THE HIGHEST INTERSTITIAL GROUND WATER VELOCITY HAS BEEN DETERMINED TO BE 1905 FT/YEAR TO THE NORTH-NORTHEAST IN THE GRAPHITIC GNEISS. THE LOWEST GROUNDWATER VELOCITY WAS CALCULATED TO BE 113 FT/YEAR IN THE STOCKTON FORMATION.

- \* LABORATORY ANALYSES OF GROUND WATER SAMPLES SECURED FROM ALL SITE MONITORING WELLS INDICATE THAT 17 DIFFERENT VOC'S WERE DETECTED DURING THE MONITORING PERIOD AND APPEAR BELOW:

TOLUENE	1,2-DICHLOROETHANE
CHLOROBENZENE	1,1,1-TRICHCHLOROETHANE
VINYL CHLORIDE	CARBON TETRACHLORIDE
CHLOROETHANE	1,2-DICHLORPROPANE
METHYLENE CHLORIDE	TRANS-1, 3-DICHLOROPROPENE
1,1-DICHLOREOTHENE	TRICHLOROETHENE
1,2-DICHLOROETHANE	TETRACHLOROETHENE
TRANS-1,2-DICHLORETHENE	ACROLEIN
CHLOROFORM	

- \* OF THESE, TRICHLOROETHENE AND TRANS-1,2 DICHLOROETHENE COLLECTIVELY ACCOUNTED FOR 90% TO 100% OF THE TOTAL VOC'S PRESENT, IF ANY, IN A GIVEN SAMPLE.
- \* VINYL CHLORIDE WAS FOUND TO BE PRESENT AT SIX MONITORING WELLS (1,2,4,7,11, AND 16). 1,1 DICHLOROETHENE, 1,2-DICHLOROETHANE AND 1,1,1-TRICHLOROETHANE WERE REPEATEDLY REPORTED WITHIN MONITORING WELLS AT LESS THAN APPROXIMATELY 50 PPB CONCENTRATIONS LEVELS.
- \* MIGRATION OF VOLATILE ORGANIC COMPONENTS IS CONTROLLED TO A HIGH DEGREE BY LOCAL GROUNDWATER GRADIENT WHICH PRODUCES A NORTH, NORTHWESTERLY, AND NORTHWESTERLY FLOW (AND CONTAMINANT TRANSPORT) TOWARD TWO LOCAL DISCHARGE AREAS WHICH CONVERGE TO THE NORTH OF KIMBERTON. THE PRIMARY DIRECTION OF VOC MOVEMENT ALSO COINCIDES WITH THE DIRECTION OF INCREASED AQUIFER PERMEABILITY AND INTERSTITIAL GROUND WATER VELOCITY.
- \* NO DEEP MOVEMENT OF VOC'S ALONG BEDDING PLANES IN THE STOCKTON FORMATION WAS DETECTED TO THE NORTH OR EAST OF THE SITE.
- \* THE UPWARD VERTICAL HYDRAULIC GRADIENT IN THE STOCKTON FORMATION IN THE DISCHARGE AREA TO THE NORTH OF THE KNOWN VOC PLUME WILL DETER THE DOWNWARD MOVEMENT OF VOC'S. AS PREVIOUSLY CONCLUDED, VOC MOVEMENT HAS BEEN DETERMINED TO BE IN THE DIRECTION OF DECREASED HYDRAULIC HEAD.
- \* DEEP VOC MIGRATION IN THE GRAPHITIC GNEISS TO THE NORTHWEST OF THE SITE, ACROSS THE GROUND WATER DIVIDE, HAS NOT BEEN DETECTED AND SHOULD NOT OCCUR UNDER NORMAL HYDRAULIC CONDITIONS.
- \* VOC'S OCCUR AT INTERMEDIATE DEPTHS IN A VERTICAL MIXING ZONE WITHIN FRACTURED BEDROCK GNEISS IN THE CENTRAL PLUME AREA.
- \* VOC'S PRESENT IN SHALLOW GROUND WATER TO THE WEST OF THE SITE IN A LATERAL DOWN GRADIENT DIRECTION ARE BELIEVED TO DISCHARGE TO STREAM A.
- \* VOC'S PRESENT IN SHALLOW GROUND WATER TO THE WEST OF THE SITE IN A LATERAL DOWN GRADIENT DIRECTION ARE BELIEVED TO DISCHARGE TO STREAM A.
- \* THE EXTENT OF THE VOC CONTAMINATION IN SHALLOW GROUND WATER HAS BEEN DEFINED TO THE NORTH, SOUTH, AND SOUTHWEST OF THE FORMER LAGOON AREA. TO THE NORTH OF THE SITE, PUMPING AT THE KIMBERTON COUNTRY HOUSE HAS ALTERED THE CONFIGURATION OF THE

CONTAMINANT PLUME BUT THE EXTENT OF THE VOC CONTAMINATION HAS BEEN DEFINED BY GRANULAR ACTIVATED CARBON (GAC) SYSTEM AND MONITORING WELL SAMPLING NORTH AND WEST OF THE KIMBERTON COUNTRY HOUSE. COMMERCIAL AND/OR RESIDENTIAL PUMPING TO THE SOUTHEAST OF THE SITE NEAR THE INTERSECTION OF ROUTE 113 AND COLDSTREAM ROAD HAS ALSO ALTERED THE EXTENT OF THE VOC CONTAMINANT PLUME. HOWEVER, VOC CONCENTRATIONS MEASURED IN COMMERCIAL AND RESIDENTIAL WELLS DECREASED AWAY FROM THE SITE IN THIS AREA TO A MINIMUM OF APPROXIMATELY 20 PPB TOTAL VOC AT PHILLIPS SPRING (LOCATIONS 22). THE OCCURRENCE OF VOC AT THIS SPRING MAY BE A RESIDUAL EFFECT OF PAST LARGESCALE WATER WITHDRAWAL BY ROBERTS MEAT PACKING.

- \* NO VOC LEVELS WERE DETECTED IN DEEP MONITORING WELLS LOCATED NORTHWEST, NORTH AND EAST OF EXISTING VOC PLUME.
- \* NO HYDROGEOLOGIC DATA COLLECTED SUGGESTS THE PREFERENTIAL VOC MOVEMENT AGAINST HYDRAULIC GRADIENT OR POTENTIALLY ALONG THE GRAPHITIC GNEISS/STOCKTON FORMATION CONTACT ZONE.
- \* SITE HYDROGEOLOGIC DATA INDICATES THAT THE WATER BEARING ZONES OF THE GRAPHITIC GNEISS AND STOCKTON FORMATION REPRESENT A SINGLE AQUIFER SYSTEM WITH VARYING WATER TRANSMITTING CAPACITIES. SPECIFIC AREAS OF GROUND WATER RECHARGE AND DISCHARGE HAVE BEEN SHOWN TO EXIST THROUGH THE ACQUISITION OF DATA FROM SEVERAL DEEP AND SHALLOW MONITORING WELL PAIRS. HYDROLOGIC DATA INDICATES THAT GROUND WATER GRADIENT AND FLOW FROM THE FORMER LAGOON AREAS IS ORIENTED TOWARD THE NORTHWEST, NORTH AND NORTHEAST TOWARD THE IDENTIFIED LOCAL GROUND WATER DISCHARGE ZONES THAT CONVERGE JUST NORTH OF KIMBERTON ROAD. GROUNDWATER TRANSMISSION IN THE STOCKTON FORMATION HAS BEEN DETERMINED TO OCCUR DOMINANTLY ALONG BEDDING PLANES AND ALONG BEDDING STRIKE IN RESPONSE TO HYDRAULIC GRADIENT. REGIONAL GEOLOGIC MAPPING EVIDENCE INDICATES THAT BOTH THE BEDS OF THE STOCKTON FORMATION AND THE GEOLOGIC CONTACT STRIKE APPROXIMATELY NW-SE AND DIP TOWARDS THE NE. DEEP AND SHALLOW MONITORING WELLS (#31A AND #19 COMPLETED TO DEPTHS OF 200 FEET AND 59 FEET, RESPECTIVELY) PLACED IN STRATEGIC DOWN DIP LOCATIONS WITHIN THE STOCKTON FORMATION (I.E., PLACED AT LOCATIONS TO MONITOR POTENTIAL DOWN DIP VERTICAL MIGRATION) REPORT NO DETECTION OF VOC'S, INDICATING A LACK OF DOWN DIP VERTICAL MIGRATION IN THE STOCKTON FORMATION ASSOCIATED WITH THE STOCKTON/GRAPHITIC GNEISS CONTACT.

#### RESIDENTIAL AND PRIVATE WELLS

IN AUGUST-1985, A PROGRAM OF RESIDENTIAL AND PRIVATE WELL SAMPLING IN THE CENTRAL KIMBERTON AREA WAS INITIATED BY GROUNDWATER TECHNOLOGY INC. RESULTS OF THIS INITIAL SAMPLING PROGRAM INDICATED THE PRESENCE OF VOLATILE ORGANIC COMPOUNDS, PRIMARILY TRICHLOROETHYLENE (TCE), DICHLOROETHYLENE (DCE), AND VINYL CHLORIDE (VC), WITHIN THE WATER SUPPLY OF A NUMBER OF LOCAL RESIDENCES AND COMMERCIAL ESTABLISHMENTS. AS A RESULT OF THIS SAMPLING PROGRAM, ALTERNATIVE WATER SUPPLIES WERE PROVIDED TO A TOTAL OF 25 LOCATIONS WITHIN THE BOROUGH OF KIMBERTON. CURRENTLY 23 LOCATIONS RECEIVE ALTERNATIVE WATER SUPPLIES (FIGURE 13).

THE COLLECTION OF DATA THROUGH THE ONGOING SAMPLING PROGRAM HAS AND CONTINUES TO PROVIDE USEFUL INFORMATION ON GROUNDWATER PLUME DEFINITION AND MIGRATION PATTERN.

#### 4. CONCLUSION FROM THE SURFACE WATER INVESTIGATION

- \* THREE UNNAMED STREAMS DESIGNATED A, B, AND C FLOW THROUGH THE CENTRAL KIMBERTON AREA.
- \* STREAM C GENERALLY FLOWS FROM WEST TO EAST, WITH ITS SOURCE BEING A SMALL SPRING HOUSE LOCATED WITHIN A FARM PASTURE

APPROXIMATELY TWO MILES SOUTHWEST OF SAMPLE LOCATION C-5.

- \* THE MAJOR CONTRIBUTING SOURCE TO STREAM C IS THE PHILLIP'S SPRING (SAMPLE LOCATION C-3).
- \* STREAM B IS AN INTERMITTENT STREAM WHICH ORIGINATES FROM THE DISCHARGE OF A SUBSURFACE CONCRETE PIPE. THE SOURCE OF THE STREAM IS PRESENTLY UNKNOWN, BUT THE ORIENTATION OF THE PIPE INDICATES THAT THE SOURCE AREA WOULD BE LOCATED EAST TO SOUTHEAST OF SAMPLE POINT B-4.
- \* DOWNSTREAM OF SAMPLE POINT B-1, STREAM B DISCHARGES INTO STREAM A.
- \* STREAM A, WHICH IS THE PRIMARY STREAM IN THE CENTER OF KIMBERTON, FLOWS GENERALLY FROM SOUTH TO NORTH AND ORIGINATES PROXIMAL TO FITZSIMMONS POND AND COALESCE WITH FRENCH CREEK APPROXIMATELY 3,000 FEET NORTH OF THE MONSEY PROPERTY.
- \* SEDIMENT SAMPLE ANALYTICAL RESULTS OBTAINED FROM STREAM A INDICATE LOW CONCENTRATIONS OF VOLATILE ORGANIC COMPOUNDS TRICHLOROETHENE AND TRANS-1,2 DICHLOROETHENE, AT SAMPLE LOCATIONS A-4, A-6, AND A-8.
- \* SEVERAL POSITIVELY AND TENTATIVELY IDENTIFIED SEMIVOLATILE COMPOUNDS WERE OBSERVED IN SEDIMENT SAMPLE A-8 DOWNSTREAM FROM THE MONSEY PROPERTY. THESE COMPOUNDS HAVE BEEN ATTRIBUTED TO A DOCUMENTED RELEASE OF ASPHALTIC MATERIAL FROM THE MONSEY PROPERTY.
- \* SEVERAL SEMIVOLATILE COMPOUNDS WERE OBSERVED IN THE BACKGROUND SEDIMENT SAMPLE (A-17).
- \* SAMPLE POINT A-10, WHICH IS A PRIMARY CONTRIBUTORY SOURCE TO THE BASELINE FLOW OF STREAM A, DEMONSTRATED THE PRESENCE OF TRANS-1,2-DICHLOROETHENE (790 UG/1), TRICHLOROETHENE (800 UG/1), AND 1,1-DICHLOROETHENE (9 UG/1).
- \* SAMPLING POINTS DOWNSTREAM FROM SPRING A-10 (A-9, A-7, A-5, A-3, A-2, AND A-1) INDICATE DECREASING CONCENTRATIONS OF TRANS-1,2-DICHLOROETHENE AND TRICHLOROETHENE.
- \* BOTH QUANTITATIVE GAS CHROMATOGRAPHY/MASS SPECTROGRAPHY (GC/MS) AND SEMI-QUANTITATIVE (GC) ANALYSIS OF STREAM B SAMPLES, 8-3 AND B-4, DEMONSTRATED THE ABSENCE OF VOLATILE ORGANIC COMPOUNDS.
- \* STREAM B SAMPLES, B-1, B-2, AND B-3, WERE ONLY ANALYZED BY THE PORTABLE GAS CHROMATOGRAPH (GC). B1 DEMONSTRATED THE PRESENCE OF TRANS(CIS)-1,2-DICHLOROETHENE, 1,1-DICHLOROETHENE, AND TRICHLOROETHENE, AND B-2 DEMONSTRATED THE PRESENCE OF TRANS(CIS)-1,2,-DICHLOROETHENE AND TRICHLOROETHENE WHILE SAMPLE B-3 DEMONSTRATED THE ABSENCE OF VOCS.
- \* FIVE SURFACE WATER SAMPLES WERE COLLECTED ALONG STREAM C AND ANALYZED BY BOTH GC/MS AND GC METHODOLOGY. SAMPLES C-4 AND C-5 WERE CHARACTERIZED BY THE ABSENCE OF VOCS WHEREAS SAMPLE C-3, WHICH IS A MAJOR CONTRIBUTORY SOURCE FOR STREAM C, DEMONSTRATED THE PRESENCE OF TRICHLOROETHENE (17 UG/1).
- \* SAMPLE POINTS C-2 AND C-4, LOCATED DOWNSTREAM FROM C-3, INDICATED DECREASING TRICHLOROETHENE CONCENTRATIONS.
- \* STREAM C SAMPLES, OBTAINED UPSTREAM FROM LOCATION C-3, WERE CHARACTERIZED BY THE ABSENCE OF VOCS. SAMPLE C-3, WHICH REPRESENTS THE MAJOR CONTRIBUTORY SOURCE FOR STREAM C, DEMONSTRATED THE PRESENCE OF TRICHLOROETHENE (17 UG/1).

THE COMPOUNDS THAT HAVE BEEN DETECTED IN SURFACE WATER ARE:

1,1-DICHLOROETHENE

TRANS-1,2-DICHLOROETHENE

TRICHLOROETHENE

WATER SOLUBILITY IS AN IMPORTANT FACTOR AFFECTING A CONSTITUENT'S RELEASE AND SUBSEQUENT MIGRATION AND FATE IN THE SURFACE WATER ENVIRONMENT. HIGHLY SOLUBLE CONTAMINANTS ARE EASILY AND QUICKLY DISTRIBUTED WITHIN THE HYDROLOGIC CYCLE. THESE CONTAMINANTS TEND TO HAVE RELATIVELY LOW BIOCONCENTRATION FACTORS IN AQUATIC LIFE AND RELATIVELY LOW ADSORPTION COEFFICIENTS FOR SOILS AND SEDIMENTS. ALL THE DETECTED COMPOUNDS IN KIMBERTON SURFACE WATERS HAVE HIGH SOLUBILITIES IN WATER.

HENRY'S LAW CONSTANT INDICATES THE RELATIVE TENDENCY OF A CONSTITUENT TO VOLATILIZE FROM AQUEOUS SOLUTION TO THE ATMOSPHERE BASED ON THE COMPETITION BETWEEN ITS VAPOR PRESSURE AND WATER SOLUBILITY. CONSTITUENTS WITH HIGH VALUES OF THE HENRY'S LAW CONSTANT WILL TEND TO VOLATILIZE TO THE ATMOSPHERE FASTER THAN CONSTITUENTS WITH LOW VALUES AND, THEREFORE, WILL PREDOMINANTLY OCCUR IN LOW CONCENTRATIONS IN SURFACE WATERS. THE DETECTED COMPOUNDS IN SURFACE WATERS OF THE KIMBERTON AREA HAVE HIGH HENRY'S LAW CONSTANTS.

## 5. WETLAND ASSESSMENT

### A. ASSESSMENT OF POTENTIAL IMPACT

THE AREAS WHERE VEGETATIVE STRESS MAY BE APPARENT, (FIGURE 15) SUCH AS STREAM BANKS AND GROUND WATER DISCHARGE POINTS, WERE EXAMINED DURING THE QUALITATIVE INVENTORY. TYPICAL INDICATORS OF VEGETATIVE STRESS THAT WERE LOOKED FOR INCLUDED DENUDED AREAS, STUNTED GROWTH, CHLOROSIS (YELLOWING), EXCESSIVE DEAD WOOD (TREES AND SHRUBS), AND CANOPY DENSITY (OVERSTORY).

A TOTAL OF SEVEN SURFACE SOIL SAMPLES (0-3 INCHES) WERE COLLECTED FROM REPRESENTATIVE VEGETATIVE ASSEMBLAGES WITHIN WETLAND AREA A (FIGURE 16).

NO AREAS OF VEGETATIVE STRESS WERE OBSERVED ALONG STREAMS A, B, C OR ADJACENT TO ANY GROUND WATER DISCHARGE POINTS. OVA READINGS OF ZERO WERE OBSERVED DURING THE COLLECTION OF EACH SOIL SAMPLE. ACETONE WAS DETECTED IN ALL SAMPLES INCLUDING THE TRAVEL BLANK. SAMPLE SS2W CONTAINED AN ESTIMATED VALUE OF 14 PPB OF METHYLENE CHLORIDE ACETONE AND METHYLENE CHLORIDE ARE COMMONLY USED CHEMICAL IN THE LABORATORY AND THEREFORE SUGGEST LABORATORY CONTAMINATION.

### B. WATER QUALITY CRITERIA FOR THE PROTECTION OF AQUATIC LIFE

ON MARCH 28 AND 29, 1988, 19 SURFACE WATER SAMPLES WERE COLLECTED AND ANALYZED FOR PRIORITY POLLUTANT VOCs FROM STREAMS A, B, AND C. SAMPLE LOCATIONS ARE PRESENTED IN FIGURE 14. RESULTS OF THE ANALYSES ARE PRESENTED IN TABLE 3. SAMPLE LOCATIONS UPSTREAM OF THE MONSEY FACILITY ON STREAM A (A-16 AND A-15) DID NOT REVEAL THE PRESENCE OF VOLATILE ORGANIC COMPOUNDS. SPRINGS ADJACENT TO THE MONSEY FACILITY AND SAMPLING POINTS DOWNSTREAM INDICATED THE PRESENCE OF TRANS-1,2-DICHLOROETHENE AND TRICHLOROETHENE. SAMPLING POINT A-10, A MAJOR CONTRIBUTORY SOURCE TO THE BASELINE FLOW OF STREAM A, CONTAINS THE HIGHEST LEVELS OF TRANS-1, 2-DICHLOROETHENE (790 UG/L) AND TRICHLOROETHENE (800 UG/L). A-10 WAS THE ONLY STATION TO CONTAIN 1,1-DICHLOROETHENE AT A CONCENTRATION OF 9 UG/L.

SAMPLES TAKEN SEQUENTIALLY FARTHER DOWNSTREAM FROM A-10 INDICATE A PROGRESSIVE DECREASE IN CONCENTRATION OF TRANS-1,2-DICHLOROETHENE AND TRICHLOROETHENE AS A RESULT OF DILUTION.

TWO SAMPLING POINTS (B-3 AND B-4) ALONG STREAM B DID NOT INDICATE THE PRESENCE OF VOLATILE ORGANIC COMPOUNDS. FIVE SAMPLING POINTS ALONG STREAM C SHOW THE UPPER TWO STATIONS (C-5 AND C-4) DEVOID OF VOLATILE ORGANIC COMPOUNDS WHILE THE DOWNSTREAM STATIONS (C-3, C-2 AND C-1)

CONTAIN TRICHLOROETHENE AT CONCENTRATIONS OF 17 UG/1, 9 UG/1 AND 7 UG/1, RESPECTIVELY. SAMPLING POINT C-3 (PHILLIPS SPRING) IS A PRIMARY CONTRIBUTORY SOURCE OF STREAM C AS INDICATED FROM THE CHEMICAL RESULTS. THE DETECTION OF TRANS-1, 2-DICHLOROETHENE AND TRICHLOROETHENE IN STREAM A AND TRICHLOROETHENE IN STREAM C INDICATES THAT THE HIGHEST CONCENTRATION OF BOTH POLLUTANTS OCCURS IN CONJUNCTION WITH SPRINGS. THIS OBSERVATION IS SIMILAR TO THE OBSERVATION MADE BY GTI IN APRIL 1982 FROM SPRING SAMPLES DRAINING INTO STREAM A, WHICH INDICATED THAT THE VOCS MAY BE ENTERING THE STREAMS PRIMARILY FROM GROUND WATER DISCHARGE POINTS.

DATA AVAILABLE FOR DICHLOROETHENE (DCE) AND TRICHLOROETHENE (TCE) INDICATE THAT THE LEVEL OF ACUTE TOXICITY FOR FRESHWATER AQUATIC LIFE OCCURS AT A CONCENTRATION OF 11,600 AND 45,000 UG/1, RESPECTIVELY (US EPA 1986). THE LC(50) VALUES FOR TWO FRESHWATER INVERTEBRATES (DAPHNIA MAGNA AND DAPHNIA PULEX) WHEN EXPOSED TO TRICHLOROETHENE ARE 64,000 UG/L AND 45,000 UG/L, RESPECTIVELY. NEITHER EAPHNID SHOWED CHRONIC EFFECTS WHEN EXPOSED TO 10,000 UG/L OF TRICHLOROETHENE. ACUTE TOXICITY TESTS PERFORMED ON FATHEAD MINNOWS (PIMEPHALES PROMELAS) TO TCE IN FLOW-THROUGH AND STATIC TEST SYSTEMS YIELDED LC50'S OF 40,700 UG/L AND 66,800 UG/L, RESPECTIVELY. A LOSS OF EQUILIBRIUM WAS OBSERVED IN FATHEAD MINNOWS EXPOSED TO 21,900 UG/L OF TCE. THE 96-HOUR LC(50) FOR BLUEGILLS (LEPOMIS MACROCHIRUS) WAS OBTAINED AT A TCE CONCENTRATION OF 44,700 UG/L. THE CALCULATED BIOCONCENTRATION FACTOR FOR BLUEGILLS (L. MACROCHIRUS) WAS 17. ACCORDING TO THE EPA QUALITY CRITERIA FOR WATER, 1980, THE OCCURRENCE OF CHRONIC TOXICITY IN AQUATIC ORGANISMS CAUSED BY TCE IS QUESTIONABLE, SINCE THE HALF-LIFE OF TCE IN TISSUES IS LESS THAN ONE DAY (USEPA 1980).

THE MAXIMUM DCE AND TCE CONCENTRATIONS FOUND IN SPRING A-10 790 UG/1 AND 800 UG/L, RESPECTIVELY ARE WELL BELOW THOSE LISTED IN TO THE AVAILABLE LITERATURE ON THE ACUTE AND CHRONIC EFFECTS OF DCE AND TCE. THE OBSERVED LEVELS OF DCE AND TCE DO NOT APPEAR TO BE OF CONCERN TO THE INDIGENOUS AQUATIC COMMUNITY. THIS APPEARANCE IS FURTHER SUBSTANTIATED BY THE INHERENT LOW BIOACCUMULATION FACTORS OF 5.6, 1.6 AND 10.6 FOR 1,1-DICHLOROETHENE, TRANS-1,2-DICHLOROETHENE AND TRICHLOROETHENE, RESPECTIVELY.

#### C. CONCLUSIONS OF THE ENDANGERMENT ASSESSMENT

THE ENDANGERMENT ASSESSMENT (EA) FOR THE KIMBERTON SITE HAS EXAMINED THE EXISTING DATA, IDENTIFIED COMPOUNDS OF CONCERN, EVALUATED POTENTIAL EXPOSURE PATHWAYS, AND APPROXIMATED POTENTIAL RISKS TO HUMAN AND OTHER ENVIRONMENTAL RECEPTORS. THE EA REPORT EVALUATES BOTH PRESENT RISK UNDER EXISTING CONDITIONS AND THE HYPOTHETICAL RISK SHOULD EXISTING CONDITIONS CHANGE. THE HYPOTHETICAL RISK CALCULATED IN THE EA REPORT IS REPRESENTATIVE OF THE WORST CASE ASSUMPTIONS (TABLE 4).

THE HYPOTHETICALLY EXPOSED POPULATION INCLUDES ALL RESIDENCES IN WHICH WELL WATER QUALITY HAS BEEN AFFECTED. THE POTENTIALLY EXPOSED POPULATION HAS BEEN PROVIDED WITH INDIVIDUAL POINT-OF-USE CARBON TREATMENT SYSTEMS. THEREFORE, THERE IS CURRENTLY NO EXPOSURE TO PUBLIC THROUGH INGESTION OF CONTAMINATED GROUND WATER, DERMAL CONTACT WHILE BATHING OR THROUGH INHALATION OF VOC WHILE BATHING. IF THE CURRENT WATER TREATMENT SYSTEM IS MAINTAINED, THERE WILL BE NO RISK TO THE POTENTIALLY-EXPOSED POPULATION. IF CURRENT CONDITIONS CHANGE (I.E., NO CARBON TREATMENT SYSTEM OR NO ALTERNATE SOURCE OF DRINKING WATER), THEN THERE WOULD BE A RISK TO THE POTENTIALLY EXPOSED POPULATION.

THE CONCLUSIONS THAT CAN BE INFERRED FROM THE RESULTS OF THE ENDANGERMENT ASSESSMENT ARE AS FOLLOWS:

#### ACTUAL

- \* RISKS FROM COMPOUNDS DETECTED IN GROUND WATER IS APPROXIMATED TO BE ZERO (CARBON TREATMENT SYSTEMS IN PLACE),
- \* CARCINOGENIC RISKS AND HAZARD INDICES FOR SURFACE WATER EXPOSURE (I.E., DERMAL CONTACT WITH AND INHALATION OF VOCS IN

SURFACE WATER AND DERMAL CONTACT WITH PAHS IN STREAM SEDIMENTS)  
TO CHILDREN ARE WITHIN US EPA'S RECOMMENDED GUIDELINES, AND

- \* NO DRINKING WATER LEVELS ARE EXCEEDED AT THE POINT OF USE  
(AFTER CARBON TREATMENT);

#### HYPOTHETICAL

- \* NONCARCINOGENIC HAZARD INDICES FROM TRANS-1,2,DCE EXPOSURE IN  
UNTREATED GROUND WATER EXCEED ONE,
- \* CARCINOGENIC RISK FROM TRICHLOROETHENE AND VINYL CHLORIDE  
EXPOSURE IN UNTREATED GROUND WATER IS  $1 \times (10^{-2})$  WHICH EXCEEDS  
US EPA'S RECOMMENDED GUIDELINES OF  $1 \times (10^{-4})$  TO  $1 \times (10^{-7})$  FOR  
CERCLA SITES,
- \* CARCINOGENIC RISK FROM PAH EXPOSURE IN STREAM SEDIMENTS IN  
 $2 \times (10^{-8})$  IS AN ORDER OF MAGNITUDE LOWER THAN US EPA'S  
RECOMMENDED GUIDELINE.
- \* APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR  
UNTREATED GROUNDWATER USE ARE EXCEEDED.

THERE ARE NO SPECIAL HABITANTS OR SPECIES AT THE SITE AND NO INDICATION  
OF STRESSED VEGETATION AT GROUND WATER DISCHARGE POINTS. THE WETLANDS  
APPEAR TO BE HEALTHY AND FUNCTIONAL, NON-IMPACTED BY COMPOUNDS DETECTED  
AT THE SITE.

COMPARISON OF AQUATIC LIFE CRITERIA WITH THE ACTUAL CONCENTRATIONS IN  
THE STREAM AND STREAM SEDIMENTS SHOWS THAT THE AQUATIC CRITERIA ARE NOT  
EXCEEDED.

IT SHOULD BE NOTED THAT THE CARCINOGENIC RISK AT THE SITE WAS ESTIMATED  
BASED ON PEOPLE USING GROUND WATER FOR DRINKING AND BATHING PURPOSES.  
THIS EXPOSURE SCENARIO IS NO LONGER PLAUSIBLE SINCE THE RESIDENTS WERE  
SUPPLIED WITH CARBON TREATMENT SYSTEMS.

THE HYPOTHETICAL EXPOSURE SCENARIO AND SUBSEQUENT RISK CALCULATIONS WERE  
ADDRESSED ONLY TO DETERMINE THE DEGREE OF RISK POSED BY CHEMICAL  
COMPOUNDS INTO THE GROUND WATER SO THAT VARIOUS REMEDIAL ALTERNATIVES  
COULD BE RANKED. THUS, THE CALCULATED CARCINOGENIC AND NONCARCINOGENIC  
RISK POSED BY COMPOUNDS IN THE GROUNDWATER TO THE RESIDENTIAL AREAS  
DOES NOT EXIST AT THIS TIME.

#CRH

#### VI. COMMUNITY RELATIONS HISTORY

THE MAIN COMMUNITY CONCERNS FOR THE AFFECTED RESIDENTS AND BUSINESSES  
REVOLVE AROUND THE ISSUE OF:

1. GROUNDWATER CONTAMINATION ON AND OFF-SITE,
2. QUALITY OF ALTERNATE WATER SUPPLIES, AND
3. DESIRE OF AFFECTED RESIDENTS TO REMAIN ON PRIVATE WELLS.

#RAO

#### VII. REMEDIAL ALTERNATIVE OBJECTIVES

BASED UPON THE INFORMATION PRESENTED IN THE REMEDIAL INVESTIGATION AND  
RISK ASSESSMENT, THE FOLLOWING REMEDIAL ACTION OBJECTIVES HAVE BEEN DEVELOPED:

1. HYDRAULIC GROUNDWATER CONTROL SHOULD BE ESTABLISHED TO CONTAIN THE  
IDENTIFIED SITE CONTAMINANTS AND TO REDUCE THE CONCENTRATION AND  
MASS OF THESE CONTAMINANTS PRESENT IN GROUNDWATER.
2. A LOCAL SPRING (SPRING A-10) SHOULD BE REMEDIATED TO IMPROVE THE

WATER QUALITY OF A LOCAL STREAM DESIGNATED AS "A" (SEE FIGURE 16).

FIVE ALTERNATIVES WERE SPECIFICALLY DEVELOPED TO ADDRESS THE GROUND AND SURFACE WATER CONTAMINATION AT THE SITE. THESE ALTERNATIVES WERE IDENTIFIED AND EVALUATED ACCORDING TO THE PREVIOUS DESCRIBED CRITERIA REQUIRED BY CERCLA.

APPROPRIATE GENERAL RESPONSE ACTIONS FOR REMEDIATION OF GROUND WATER AND SURFACE WATER AT THE KIMBERTON SITE HAVE BEEN IDENTIFIED IN TABLE 5. THESE GENERAL RESPONSE ACTIONS ARE DESCRIBED IN THE FOLLOWING PARAGRAPHS.

#### VIII. DESCRIPTION OF REMEDIAL ALTERNATIVES

##### A. IDENTIFICATION OF POTENTIAL REMEDIAL TECHNOLOGY TYPES AND PROCESSES

TECHNOLOGY TYPES AND ASSOCIATED PROCESSES THAT ARE POTENTIALLY APPROPRIATE FOR THE KIMBERTON SITE HAVE BEEN IDENTIFIED. EACH OF THESE TECHNOLOGIES WILL BE DESCRIBED AND SCREENED ACCORDING TO THE FOLLOWING CRITERIA:

- \* EFFECTIVENESS: EACH REMEDIAL TECHNOLOGY MUST BE EVALUATED ACCORDING TO ITS EFFECTIVENESS IN PROTECTING HUMAN HEALTH AND THE ENVIRONMENT. TREATMENT TECHNOLOGIES ARE EVALUATED ON THEIR EFFECTIVENESS IN REMOVING SITE-SPECIFIC CONSTITUENTS FROM THE CONTAMINATED MEDIA.
- \* ABILITY TO MEET REMEDIAL OBJECTIVES: REMEDIAL TECHNOLOGIES WILL BE EVALUATED BASED UPON THEIR ABILITY TO REDUCE THE CONCENTRATIONS AND MASS OF VOCs IN THE AQUIFER AND/OR THEIR ABILITY TO MITIGATE THE EXTENT OF VOCs ENTERING THE SURFACE WATER.
- \* TECHNOLOGY FEASIBILITY. THIS EVALUATION INCLUDES CONSIDERATION OF THE ABILITY TO CONSTRUCT, SUCCESSFULLY OPERATE, AND MAINTAIN EACH SYSTEM.
- \* POTENTIALLY ADMINISTRATIVE REQUIREMENTS: THE ADMINISTRATIVE FEASIBILITY EVALUATION CONSIDERS SUCH FACTORS AS PERMITTING AND MONITORING REQUIREMENTS.

##### B. SELECTION OF TECHNOLOGIES FOR GROUNDWATER

A SUMMARY OF THE CRITERIA EVALUATIONS FOR GROUND WATER REMEDIATION TECHNOLOGIES IS PRESENTED IN TABLE 8. THE RESULTS OF THIS SELECTION PROCESS ARE DESCRIBED BELOW.

- \* CONTINUED PROVISION OF ALTERNATE WATER SUPPLIES: RETAINED BECAUSE IT IS PROTECTIVE OF PUBLIC HEALTH AND THE ENVIRONMENT.
- \* EXTRACTION WELLS: RETAINED FOR EXTRACTION OF GROUND WATER FOR TREATMENT.
- \* IN SITU BIORECLAMATION: ELIMINATED BECAUSE SITE-RELATED CONTAMINANTS ARE DIFFICULT TO DEGRADE AND IN SITU TREATMENT WOULD BE LESS RELIABLE AND CONTROLLABLE THAN ON-SITE TREATMENT.
- \* AIR STRIPPING: RETAINED BECAUSE IT IS A PROVEN TECHNOLOGY FOR REMOVAL OF SITE-RELATED CONSTITUENTS FROM WATER.
- \* GAC ADSORPTION: ELIMINATED BECAUSE THIS TECHNOLOGY EXHIBITS LIMITED EFFECTIVENESS IN REMOVING VINYL CHLORIDE FROM WATER.
- \* CHEMICAL OXIDATION: RETAINED BECAUSE IT IS A PROVEN TECHNOLOGY FOR REMOVAL OF SITE-RELATED CONSTITUENTS FROM WATER.
- \* BIOLOGICAL TREATMENT: ELIMINATED BECAUSE IT WOULD NOT BE PRACTICAL FOR REMOVAL OF LOW CONCENTRATIONS OF CONSTITUENTS FROM WATER AT THE KIMBERTON SITE.



- \* TREATMENT BY A POTW: RETAINED BECAUSE IT WOULD BE AN EFFECTIVE TECHNOLOGY FOR REMOVAL OF SITE-RELATED CONSTITUENTS FROM WATER IN COMBINATION WITH HIGHER STRENGTH MUNICIPAL WASTEWATER.

IN SUMMARY THE GROUND WATER REMEDIATION TECHNOLOGIES THAT SHALL BE RETAINED FOR INCLUSION IN THE DEVELOPMENT OF ALTERNATIVES INCLUDE THE FOLLOWING:

- \* CONTINUED PROVISION OF ALTERNATE WATER SUPPLIES,
- \* EXTRACTION WELLS,
- \* AIR STRIPPING,
- \* CHEMICAL OXIDATION, AND
- \* TREATMENT BY A POTW

#### C. SELECTION OF TECHNOLOGIES FOR SURFACE WATER

A SUMMARY OF THE CRITERIA EVALUATIONS FOR SURFACE WATER REMEDIATION TECHNOLOGIES IS PRESENTED IN TABLE 7. THE RESULTS OF THIS SELECTION PROCESS ARE DESCRIBED BELOW:

- \* NO ACTION: RETAINED BECAUSE IT IS PROTECTIVE OF PUBLIC HEALTH AND APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) FOR SURFACE WATER ARE NOT EXCEEDED.
- \* COLLECTION SUMP: RETAINED FOR COLLECTION OF SPRING A-10 FOR TREATMENT.
- \* AIR STRIPPING: RETAINED BECAUSE IT IS A PROVEN TECHNOLOGY FOR REMOVAL OF SITE-RELATED CONSTITUENTS FROM WATER.
- \* GAC ADSORPTION: ELIMINATED BECAUSE THIS TECHNOLOGY EXHIBITS LIMITED EFFECTIVENESS IN REMOVING VINYL CHLORIDE (A BREAK DOWN PRODUCT OF SPRING-RELATED CONSTITUENTS) FROM WATER.
- \* CHEMICAL OXIDATION: RETAINED BECAUSE IT IS A PROVEN TECHNOLOGY FOR REMOVAL OF SITE-RELATED CONSTITUENTS FROM WATER.
- \* BIOLOGICAL TREATMENT: ELIMINATED BECAUSE IT WOULD NOT BE PRACTICAL FOR REMOVAL OF LOW CONCENTRATIONS OF CONSTITUENTS FROM WATER FROM THE KIMBERTON SITE.
- \* TREATMENT BY POTW: RETAINED BECAUSE IT WOULD BE AN EFFECTIVE TECHNOLOGY FOR REMOVAL OF SITE-RELATED CONSTITUENTS FROM WATER IN COMBINATION WITH HIGHER STRENGTH MUNICIPAL WASTEWATER.

IN SUMMARY, THE SURFACE WATER REMEDIATION TECHNOLOGIES THAT WILL BE RETAINED FOR INCLUSION IN THE DEVELOPMENT OF ALTERNATIVES INCLUDE THE FOLLOWING:

- \* NO ACTION,
- \* COLLECTION SUMP,
- \* AIR STRIPPING,
- \* CHEMICAL OXIDATION, AND
- \* TREATMENT BY A POTW.

#### EVALUATION OF TECHNOLOGIES FOR REMEDIATION OF SPRING A-10 AND THE GROUNDWATER

ALTERNATIVES FOR REMEDIATION OF SPRING A-10 AND CONTAMINATED GROUNDWATER HAVE BEEN DEVELOPED AS SHOWN IN TABLE 8, AND ARE LISTED BELOW:

1. NO ACTION,
2. CONTINUED PROVISION OF ALTERNATE WATER SUPPLIES,
3. CONTINUED PROVISION OF ALTERNATE WATER SUPPLIES AND COLLECTION AND TREATMENT OF SPRING A-10,
4. CONTINUED PROVISION OF ALTERNATE WATER SUPPLIES, COLLECTION

AND TREATMENT OF SPRING A-10 AND ONSITE SOURCE CONTROL AND GROUNDWATER REMEDIATION, AND

5. CONTINUED PROVISION OF ALTERNATE WATER SUPPLIES, COLLECTION AND TREATMENT OF SPRING A-10, ON-SITE SOURCE CONTROL AND GROUND WATER REMEDIATION, AND OFF-SITE GROUND WATER REMEDIATION.

ALTERNATIVES 1 AND 2 OFFER NO REMEDIATION OF THE SURFACE WATER OR GROUND WATER AT THE KIMBERTON SITE. ALTERNATIVE 3 INCLUDES SURFACE WATER REMEDIATION ONLY, WHILE ALTERNATIVES 4 AND 5 REQUIRE THE REMEDIATION OF SURFACE AND GROUND WATER.

ALTERNATIVE 4 REQUIRES THE ON-SITE EXTRACTION OF THE MOST CONTAMINATED GROUND WATER LOCATED IN THE CENTER OF THE VOC PLUME. IN ADDITION, GROUND WATER WOULD BE EXTRACTED FROM WELLS LOCATED AT THE DOWN GRADIENT BOUNDARY OF THE SITE TO PREVENT FURTHER OFF-SITE MIGRATION OF VOCs.

ALTERNATIVE 5 WOULD REQUIRE ON-SITE AND OFF-SITE EXTRACTION OF GROUND WATER FROM EXTRACTION WELLS LOCATED IN BOTH THE GRAPHITIC GNEISS AND STOCKTON FORMATION. THIS WOULD PROVIDE AN EXTENSIVE GROUND WATER RECOVERY PROGRAM ADDRESSING ALL AREAS OF THE CONTAMINANT PLUME. OPTIMUM GROUND WATER EXTRACTION RATES FOR THESE TWO ALTERNATIVES SHALL BE APPROXIMATED THROUGH THE USE OF A NUMERICAL COMPUTER MODEL.

ALTERNATIVES 3, 4, AND 5 REQUIRE TREATMENT OF THE SURFACE WATER AND/OR GROUND WATER. THE FOLLOWING TREATMENT TECHNOLOGIES WERE EVALUATED FOR EACH OF THESE ALTERNATIVES:

- A. AIR STRIPPING
- B. CHEMICAL OXIDATION, AND
- C. TREATMENT BY A POTW.

#### IX. A. APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

SECTION 121 OF CERCLA REQUIRES THAT REMEDIAL ACTIONS ACHIEVE A LEVEL OF CLEANUP OF HAZARDOUS SUBSTANCES THAT 1) PROTECTS HUMAN HEALTH AND THE ENVIRONMENT AND 2) MEETS "LEGALLY APPLICABLE" STANDARDS PROMULGATED BY USEPA OR A STATE FOR ANY HAZARDOUS SUBSTANCES OR POLLUTANTS REMAINING ON THE SITE. IN ADDITION, THE REMEDIAL ACTION MUST MEET CLEANUP CRITERIA AND REQUIREMENTS THAT ARE "RELEVANT AND APPROPRIATE UNDER THE CIRCUMSTANCES OF THE RELEASE OR THREATENED RELEASE OF SUCH HAZARDOUS SUBSTANCES OR POLLUTANT OR CONTAMINANT" (CERCLA, SECTION 121). THE LEGALLY APPLICABLE STANDARDS AND RELEVANT AND APPROPRIATE CRITERIA AT A CERCLA SITE ARE COLLECTIVELY REFERRED TO AS "ARARS."

THE WATER QUALITY STANDARDS OF PADER MAY BE LEGALLY APPLICABLE FOR THE PORTION OF THE FRENCH CREEK BASIN ENCOMPASSING THE KIMBERTON AREA (25 PA CODE 93.7). THERE ARE NO PADER WATER COMPOUNDS AT THE SITE. HOWEVER, 25 PA CODE SECTION 93.6 CONTAINS A GENERAL STANDARD THAT SURFACE WATERS MAY NOT CONTAIN SUBSTANCES FROM WASTE DISCHARGE THAT ARE IN SUCH CONCENTRATIONS OR AMOUNTS AS TO BE HARMFUL TO AQUATIC OR OTHER LIFE OR TO BE "INIMICAL" TO DESIGNATED WATER IN ORDER TO DETERMINE WHETHER THIS STANDARD IS POTENTIALLY A LIMITING FACTOR AT THE SITE, THE GROUND WATER DISCHARGES TO STREAM A MUST BE COMPARED TO USEPA'S AMBIENT WATER QUALITY CRITERIA (AWQC). THE AWQC ARE NOT EXCEEDED BY THE CONCENTRATIONS OR COMPOUNDS IN THE SURFACE WATER, AS IS SHOWN IN TABLE 9.

MAXIMUM CONTAMINANT LEVELS (MCLS) HAVE BEEN PROMULGATED BY USEPA UNDER THE SAFE DRINKING WATER ACT (40 CFR SECTIONS 141.1-141.62). MCLS ARE LEGALLY APPLICABLE TO PUBLIC WATER SUPPLIES SERVING TWENTY-FIVE (25) OR MORE PERSONS. THESE HAVE BEEN ESTABLISHED FOR TCE AND RELATED ORGANICS (40 CFR 141.61(A)). THESE MCLS FOR INDICATOR COMPOUNDS AND OTHER COMPOUNDS DETECTED AT THE SITE ARE REPORTED IN TABLE 10.

CURRENTLY, THE PUBLIC WATER SUPPLY IN KIMBERTON IS NOT AFFECTED BY THE CERCLA RELEASES, AND THEREFORE, MCLS ARE NOT LEGALLY APPLICABLE. HOWEVER, MCLS MAY BE RELEVANT AND APPROPRIATE FOR CLASS IIA AQUIFERS

EVEN WHERE NO PUBLIC WATER SUPPLY IS AFFECTED. A CLASS IIA AQUIFER IS A CURRENT OR POTENTIAL SOURCE OF DRINKING WATER (USEPA) GROUND WATER PROTECTION STRATEGY (1984) AND GUIDELINES FOR GROUNDWATER CLASSIFICATION UNDER THE USEPA GROUND WATER STRATEGY (1986). THE REGIONAL AQUIFER UNDERLYING THE SITE IS CLASSIFIED AS A CLASS IIA AQUIFER. USEPA'S INTERIM GUIDANCE STATES THAT MCLS ARE GENERALLY RELEVANT AND APPROPRIATE FOR CLASS IIA AQUIFERS AND ARE FULLY PROTECTIVE OF HUMAN HEALTH (USEPA INTERIM GUIDANCE ON COMPLIANCE WITH OTHER APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS, 52 FED. REG. 32496, 32499 (AUGUST 27, 1987)).

NOTWITHSTANDING THE GENERAL POLICY THAT MCLS ARE APPROPRIATE FOR CLASS IIA AQUIFERS, USEPA'S GUIDANCE PROVIDES THAT MCLS MAY NOT BE RELEVANT AND APPROPRIATE WHERE IT IS TECHNICALLY INFEASIBLE TO ACHIEVE MCLS. IN THOSE INSTANCES, "THE COST-EFFECTIVE REMEDY MAY BE TO PROVIDE AN ALTERNATIVE DRINKING WATER SUPPLY RATHER THAN RESTORING THE CONTAMINATED AQUIFER."

OTHER POTENTIAL ARARS ARE 1) DRINKING WATER HEALTH ADVISORY LEVELS DEVELOPED BY THE USEPA OFFICE OF DRINKING WATER (1987), AND 2) VALUES DERIVED FROM THE SUPERFUND PUBLIC HEALTH EVALUATION ANNUAL (EPA 54011-861060, OCTOBER 1986) FOR NONCARCINOGENS AND CARCINOGENS. THESE ARARS ARE ALSO PRESENTED IN TABLE 11.

#DOA

DESCRIPTION OF ARARS

FEDERAL

SAFE DRINKING WATER ACT - MCLS

CLEAN WATER ACT - AMBIENT WATER QUALITY CRITERIA

CLEAN AIR ACT, PART D

NATIONAL AMBIENT AIR QUALITY STANDARDS

STATE

PENNSYLVANIA CLEAN - AMBIENT WATER QUALITY STANDARDS  
STREAMS LAW - SECTION 402

PENNSYLVANIA RULES AND REGULATIONS  
TITLE 25 CHAPTER 93

PENNSYLVANIA SCENIC RIVERS ACT

FRENCH CREEK STATE PARK SCENIC RIVERS ACT

PENNSYLVANIA AIR RESOURCE REGULATIONS

PENNSYLVANIA AIR TOXIC GUIDELINES

ADDITIONAL REQUIREMENTS FOR PROTECTIVENESS

THE SELECTED SITE REMEDY IS CONSISTENT WITH THE FOLLOWING: FEDERAL  
EXECUTIVE ORDER 11988, - ACTION TO AVOID ADVERSE  
FLOODPLAIN MANAGEMENT 40 CFR EFFECTS, MINIMIZE  
PART 6, APPENDIX A. HARM, RESTORE AND PRESERVE  
NATURAL BENEFICIAL VALUE.

FEDERAL EXECUTIVE ORDER 11990, - ACTION TO MINIMIZE  
PROTECTION OF WETLANDS, 40 CFR DESTRUCTION, LOSS, OR  
PART 6. APPENDIX A. DEGRADATION OF WETLANDS.

ADDITIONAL REQUIREMENTS FOR PROTECTIVENESS (CONT.)

FEDERAL CLEAN WATER ACT

- DIFFERENTIAL GROUNDWATER  
POLICY CLASS IIA AQUIFER.

PENNSYLVANIA SCENIC RIVERS ACT  
FRENCH CREEK STATE PARK SCENIC  
RIVER ACT  
PENNSYLVANIA AIR RESOURCE REGULATIONS  
PENNSYLVANIA AIR TOXIC GUIDELINES

NEW JERSEY COASTAL PLAIN  
SOLE SOURCE AQUIFER

- ACTION TO MINIMIZE  
AQUIFER IMPACTS

#### X. DETAILED ANALYSIS OF RETAINED REMEDIAL ALTERNATIVES AND COMPARATIVE ANALYSIS

THIS SECTION INCLUDES A DETAILED EVALUATION OF EACH OF THE ALTERNATIVES THAT WERE RETAINED AFTER THE PRELIMINARY SCREENING PROCESS IN THE FEASIBILITY STUDY.

THE ALTERNATIVES WERE SCREENED ON THE BASIS OF EFFECTIVENESS, IMPLEMENTABILITY AND COST. ALTERNATIVE 1, NO ACTION, WAS ELIMINATED FROM FURTHER CONSIDERATION BECAUSE IT WOULD NOT PROVIDE FOR CONTINUATION OF POINT OF USE GRANULAR ACTIVATED CARBON SYSTEMS PROVIDED IN ACCORDANCE WITH AN ADMINISTRATIVE CONSENT ORDER (ACO) WITH THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES (PADEP) AND WOULD NOT ADDRESS THE CONTAMINATED GROUNDWATER. ALTERNATIVE 5, WHICH INCLUDES GROUNDWATER PUMPING OFF SITE IN THE STOCKTON FORMATION, WAS ELIMINATED FROM FURTHER CONSIDERATION BECAUSE:

1. IT WOULD NOT PROVIDE A SIGNIFICANT INCREASE IN VOC REMOVAL FROM GROUNDWATER COMPARED TO ALTERNATIVE 4.
2. IT COULD ADVERSELY AFFECT THE WATER QUALITY OF UNCONTAMINATED OFF-SITE WELLS IN THE TOWN OF KIMBERTON.
3. IT WOULD BE TECHNICALLY DIFFICULT TO CONSTRUCT DUE TO THE EXTENSIVE PIPING AND ELECTRICAL NETWORKS REQUIRED, WHICH WOULD EXTEND UNDER ROADS, OVER HILLY TERRAIN AND THROUGH RESIDENTIAL AREAS.
4. IT WOULD BE DISRUPTIVE TO ROADS AND PRIVATE PROPERTY DURING CONSTRUCTION AND SUBSEQUENT OPERATION AND MAINTENANCE REQUIREMENTS.
5. IT COULD ADVERSELY AFFECT THE WATER LEVEL OFF-SITE WELLS IN THE TOWN OF KIMBERTON.

TREATMENT TECHNOLOGIES IDENTIFIED AS POTENTIALLY APPROPRIATE FOR THE CONTAMINANTS PRESENT IN GROUND AND SURFACE WATER INCLUDE: (A) AIR STRIPPING, (B) CHEMICAL OXIDATION, (C) GAC ADSORPTION, (D) ON-SITE BIOLOGICAL TREATMENT, AND (E) TREATMENT BY A PUBLICLY OWNED TREATMENT WORKS (POTW). GAC ADSORPTION WAS ELIMINATED BY THE SCREENING PROCESS BECAUSE IT IS RELATIVELY INEFFECTIVE FOR REMOVAL OF VINYL CHLORIDE. BIOLOGICAL TREATMENT ON SITE WAS ELIMINATED BY THE SCREENING PROCESS BECAUSE IT IS NOT PRACTICAL FOR TREATMENT OF LOW CONCENTRATIONS OF CONTAMINANTS IN GROUND AND SURFACE WATER AT THE KIMBERTON SITE. CHEMICAL OXIDATION AND TREATMENT BY A POTW WERE ELIMINATED BECAUSE NEITHER PROCESS IS COST EFFECTIVE.

EACH OF THE ALTERNATIVES RECEIVED A DETAILED EVALUATION BASED UPON THE FOLLOWING CRITERIA:

- \* SHORT-TERM EFFECTIVENESS,
- \* LONG-TERM EFFECTIVENESS AND PERMANENCE,
- \* REDUCTION OF TOXICITY, MOBILITY, OR VOLUME,
- \* IMPLEMENTABILITY,
- \* COST,
- \* COMPLIANCE WITH ALL APPLICABLE OR RELEVANT AND APPROPRIATE FEDERAL OR STATE REQUIREMENTS (ARARS),
- \* OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT,

- \* STATE ACCEPTANCE, AND
- \* COMMUNITY ACCEPTANCE.

THESE CRITERIA COMBINE THE SPECIFIC CERCLA REQUIREMENTS THAT MUST BE SATISFIED IN A RECORD OF DECISION (ROD) WITH EMPHASIS ON EVALUATING LONG-TERM EFFECTIVENESS AND RELATED CONSIDERATIONS.

#### A. DESCRIPTION OF ALTERNATIVES

##### ALTERNATIVE 1- NO ACTION

ALL ALTERNATIVES CONSIDERED MUST BE JUDGED AGAINST A 'NO ACTION' ALTERNATIVE AS REQUIRED BY CERCLA TO PROVIDE A WORST CASE FOR COMPARISON WITH OTHER ALTERNATIVES. THIS ALTERNATIVE INVOLVES TAKING NO ACTIONS AT THE SITE TO REMEDIATE THE CONTAMINATION. IN ADDITION, THIS ALTERNATIVE WOULD NOT PROVIDE FOR CONTINUATION OF POINT OF USE GRANULAR ACTIVATED CARBON SYSTEMS PROVIDED BY CIBA-GEIGY AND MONSEY IN ACCORDANCE WITH AN ADMINISTRATIVE CONSENT ORDER WITH PADER.

THE NO ACTION ALTERNATIVE WOULD NOT COMPLY WITH THE ARARS FOR A CERCLA CLEANUP.

##### ALTERNATIVE 2 - CONTINUED PROVISION OF ALTERNATE WATER SUPPLIES; MONITORING; INSTITUTIONAL CONTROLS

ALTERNATIVE 2 PROVIDES FOR THE CONTINUED PROVISION OF ALTERNATE WATER SUPPLIES THROUGH GRANULAR ACTIVATED CARBON TREATMENT SYSTEM AND/OR POTABLE WATER SUPPLY STORAGE TANKS. THE GROUND WATER MONITORING PROGRAM WOULD ALSO CONTINUE TO ALLOW FOR PERIODIC REASSESSMENT OF THE EXTENT OF CONTAMINATION AND THE CONCENTRATIONS OF HAZARDOUS SUBSTANCES CONTAINED IN THE GROUND WATER. IN ADDITION, ADMINISTRATIVE CONTROLS WILL BE INSTITUTED TO PREVENT THE INSTALLATION OF NEW GROUNDWATER EXTRACTION WELLS FOR USE WITHIN THE AREA AFFECTED BY GROUNDWATER CONTAMINATION.

THE CONTAMINATES IN THE GROUNDWATER WOULD GRADUALLY MEET THE MAXIMUM CONTAMINANT LEVELS (MCLS) THROUGH NATURAL FLUSHING AND VOLATILE ORGANIC COMPOUNDS (VOCs) DEGRADATION. THE MCLS ARE PROMULGATED PURSUANT TO THE SAFE DRINKING WATER ACT (SDWA). THESE REQUIREMENTS ARE LEGALLY APPLICABLE TO PUBLIC WATER SUPPLIES SERVING TWENTY-FIVE (25) OR MORE PERSONS OR ENTAILING 15 OR MORE SERVICE CONNECTIONS. THERE ARE NO PUBLIC WATER SUPPLIES IN KIMBERTON AFFECTED BY SITE RELEASES, AND THEREFORE, MCLS ARE NOT LEGALLY APPLICABLE.

THE AQUIFER BENEATH THE KIMBERTON COMMUNITY IS CLASSIFIED AS A CLASS IIA AQUIFER UNDER THE CLEAN WATER ACT. THIS CLASSIFICATION INDICATES THAT IT IS UTILIZED AS A CURRENT OR POTENTIAL SOURCE OF DRINKING WATER. THE MCLS FOR INDICATOR COMPOUNDS AND OTHER COMPOUNDS DETECTED AT THE SITE (TABLE 10) HAVE BEEN DETERMINED TO BE RELEVANT AND APPROPRIATE.

##### ALTERNATIVE 3 - CONTINUED PROVISION OF ALTERNATE WATER SUPPLIES: MONITORING; INSTITUTIONAL CONTROLS; COLLECTION AND TREATMENT OF SPRING A-10.

THIS ALTERNATIVE IS THE SAME AS ALTERNATIVE NO. 2 PLUS THE COLLECTION OF SPRING A-10 AND THE TREATMENT OF THE WATER BY AIR STRIPPING.

WATER QUANTITY STANDARDS PROMULGATED BY PADER FOR THE PORTION OF THE FRENCH CREEK BASIN ENCOMPASSING THE KIMBERTON AREA (25 PA CODE 93.7).

THERE ARE NO PADER WATER QUALITY STANDARDS FOR TCE OR ANY OF THE INDICATOR COMPOUNDS AT THE SITE. HOWEVER, 25 PA. CODE SECTION 93.6 CONTAINS A GENERAL STANDARD THAT SURFACE WATERS MAY NOT CONTAIN SUBSTANCES FROM WASTE DISCHARGE THAT ARE IN SUCH CONCENTRATIONS OR AMOUNTS AS TO BE HARMFUL TO AQUATIC OR OTHER LIFE OR TO BE "INIMICAL" TO DESIGNATED WATER USES. IN ORDER TO DETERMINE WHETHER THIS STANDARD IS POTENTIALLY A LIMITING FACTOR AT THE SITE, THE GROUND WATER DISCHARGES TO TRIBUTARY "A" MUST BE COMPARED TO US EPA'S AMBIENT WATER QUALITY CRITERIA THAT ARE SHOWN IN TABLE 9.

THE AWQC CRITERIA DO NOT HAVE THE LEGAL EFFECT OF WATER QUALITY STANDARDS; THEY ARE ADVISORY AND ARE SUBJECT TO ADJUSTMENT TO REFLECT SITE-SPECIFIC FACTORS. AWQC VALUES FOR THE INDICATED COMPOUNDS AND OTHER COMPOUNDS DETECTED AT THE SITE ARE REPORTED IN TABLE 9.

THE SITE IS IN A NON-ATTAINMENT ZONE FOR OZONE, THEREFORE, THE EMISSIONS FROM THE AIR STRIPPING WILL COMPLY WITH PENNSYLVANIA AIR TOXICS GUIDELINES. A NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT MAY BE REQUIRED FOR THE SURFACE WATER DISCHARGE FROM THE AIR STRIPPER.

ALTERNATIVE 4 - CONTINUED PROVISION OF ALTERNATE WATER SUPPLIES, COLLECTION AND TREATMENT OF SPRING A-10 AND ON-SITE SOURCE CONTROL AND GROUNDWATER REMEDIATION

THIS ALTERNATIVE IS THE SAME AS ALTERNATIVE NO. 3 PLUS THE COLLECTION AND TREATMENT ON-SITE THROUGH GROUNDWATER PUMPING AND AIR-STRIPPING. THE TREATED WATER FROM THE AIR STRIPPER WILL BE DISCHARGED INTO STREAM A. THE EXTRACTION WELLS WILL PUMP A TOTAL OF 100 GALLONS PER MINUTE (GPM) INITIALLY, WITH A CAPACITY TO PUMP A TOTAL OF 200 GPM.

A PERMIT FROM THE DELAWARE RIVER BASIN COMMISSION WILL BE REQUIRED TO EXTRACT THE GROUNDWATER. A DRILLING PERMIT WILL ALSO BE REQUIRED FROM THE CHESTER COUNTY HEALTH DEPARTMENT.

VOC CONCENTRATIONS AND MASS IN THE GROUNDWATER WOULD BE REDUCED. MCLS WOULD BE ACHIEVED OVER A LONG PERIOD OF TIME. AIR STRIPPING AND NATURAL DEGRADATION AND FLUSHING OF THE AQUIFER WILL REDUCE VOC SIGNIFICANTLY.

POTENTIAL RELEVANT AND APPROPRIATE REQUIREMENTS INCLUDE: MAXIMUM CONTAMINANT LEVELS (MCLS), MAXIMUM CONTAMINANT LEVEL GOALS (MGLGS), DRINKING WATER HEALTH ADVISORY LEVELS DEVELOPED BY THE OFFICE OF DRINKING WATER (1987), VALUES DERIVED FROM THE SUPERFUND PUBLIC HEALTH EVALUATION MANUAL (EPA 54011-861060, OCTOBER 1986) FOR NONCARCINOGENS AND CARCINOGENS, AND AMBIENT WATER QUALITY CRITERIA (AWQC) FOR PROTECTION OF HUMAN AND AQUATIC LIFE.

#### B. DETAILED EVALUATION OF ALTERNATIVES SHORT-TERM EFFECTIVENESS

THE EVALUATION OF THE SHORT-TERM EFFECTIVENESS OF EACH REMEDIAL ACTION INCLUDES CONSIDERATION OF 1) THE PROTECTION OF THE COMMUNITY DURING THE REMEDIAL ACTION(S), 2) THE PROTECTION OF THE WORKERS DURING THE CONSTRUCTION PHASE OF THE REMEDIAL ACTION(S), 3) THE ENVIRONMENTAL IMPACTS OF THE REMEDIAL ACTION(S), AND 4) THE LENGTH OF TIME REQUIRED TO ACHIEVE THE REMEDIAL RESPONSE OBJECTIVES.

##### PROTECTION OF THE COMMUNITY

NONE OF THE ALTERNATIVES WOULD GENERATE SHORT-TERM RISK TO THE PUBLIC HEALTH. ALTERNATIVES 3 AND 4 INVOLVE TREATING GROUND AND/OR SURFACE WATER BY AIR STRIPPING; HOWEVER, THE EMISSIONS GENERATED HAVE BEEN DETERMINED TO BE WITHIN SAFE LIMITS.

##### PROTECTION OF THE WORKERS

NONE OF THE ALTERNATIVES WOULD GENERATE SHORT-TERM RISK TO THE PUBLIC HEALTH. ALTERNATIVES 3 AND 4 INVOLVE TREATING GROUND AND/OR SURFACE WATER BY AIR STRIPPING; HOWEVER, THE EMISSIONS GENERATED HAVE BEEN DETERMINED TO BE WITHIN SAFE LIMITS.

##### PROTECTION OF THE WORKERS

ALTERNATIVES 3 AND 4 REQUIRE CONSTRUCTION OF A SURFACE WATER COLLECTION SYSTEM AND/OR A GROUND WATER EXTRACTION SYSTEM. WORKERS CONSTRUCTING THE SURFACE WATER COLLECTION SYSTEM (ALTERNATIVES 3 AND 4) WOULD REQUIRE PROTECTION AGAINST DERMAL CONTACT WITH SURFACE WATER (E.G., TYVEK COVERALLS AND GLOVES). WORKERS DRILLING THE EXTRACTION WELLS

(ALTERNATIVE 4) WOULD NOT ONLY REQUIRE PROTECTION AGAINST DERMAL CONTACT, BUT COULD REQUIRE RESPIRATORY PROTECTION. THIS DETERMINATION WOULD BE MADE IN THE FIELD BASED UPON AIR MONITORING MEASUREMENTS.

#### ENVIRONMENTAL IMPACTS

CONSTRUCTION ACTIVITIES FOR IMPLEMENTATION OF ALTERNATIVES 2 AND 3 ARE ABSENT OR MINIMAL, AND THUS WOULD NOT GENERATE ADVERSE ENVIRONMENTAL IMPACTS. HOWEVER, IMPLEMENTATION OF ALTERNATIVE 4 WOULD INCLUDE GROUND WATER EXTRACTION, WHICH COULD ADVERSELY AFFECT THE GROUND WATER SUPPLY AVAILABLE TO RESIDENTS IN THE AREA.

#### TIME UNTIL RESPONSE OBJECTIVES ARE ACHIEVED

ALTERNATIVES 3 AND 4 WOULD REQUIRE THE COLLECTION AND TREATMENT OF SPRING A-10. THIS WOULD PROVIDE AN IMMEDIATE IMPROVEMENT IN WATER QUALITY IN STREAM A. ALTERNATIVE 2, HOWEVER, WOULD NOT PROVIDE ANY IMPROVEMENT IN WATER QUALITY IN STREAM A.

ALTERNATIVE 4 IS THE ONLY ALTERNATIVE THAT WOULD PROVIDE GROUND WATER REMEDIATION. GROUND WATER WOULD BE EXTRACTED AND TREATED, THEREBY CONTAINING VOCs FROM MIGRATING OFF SITE. IT IS PRESENTLY ANTICIPATED THAT GROUND WATER EXTRACTION AND TREATMENT COULD BE REQUIRED FOR APPROXIMATELY 30 YEARS. REFINEMENT OF THIS ESTIMATE WOULD BE POSSIBLE SUBSEQUENT TO INITIATION OF THE REMEDIAL PROGRAM.

#### LONG-TERM EFFECTIVENESS AND PERMANENCE

THE EVALUATION OF THE LONG-TERM EFFECTIVENESS AND PERMANENCE OF EACH REMEDIAL ACTION INCLUDES CONSIDERATION OF 1) THE MAGNITUDE OF RESIDUAL RISKS AFTER IMPLEMENTATION, 2) THE ADEQUACY OF CONTROLS, AND 3) THE RELIABILITY OF CONTROLS.

#### MAGNITUDE OF RESIDUAL RISKS AFTER IMPLEMENTATION

AT PRESENT, USE OF GROUND WATER AT THE KIMBERTON SITE POSES NO RISK TO PUBLIC HEALTH BECAUSE THE AFFECTED RESIDENCES HAVE BEEN PROVIDED WITH ALTERNATE WATER SUPPLIES. THESE RESIDENCES WOULD CONTINUE TO USE ALTERNATE WATER SUPPLIES UNTIL VOC CONCENTRATIONS IN THE GROUND WATER MEET ARARS OR UNTIL THEY ARE HOOKED UP TO PUBLIC WATER LINE. ALSO, THERE IS CURRENTLY NO SIGNIFICANT RISK ASSOCIATED WITH DERMAL CONTACT WITH OR INHALATION OF COMPOUNDS DETECTED IN SURFACE WATER. THEREFORE, RESIDUAL RISKS REMAINING AFTER IMPLEMENTATION OF ANY OF THE ALTERNATIVES WOULD BE NEGLIGIBLE.

#### ADEQUACY, OF CONTROLS

AIR STRIPPING, AS REQUIRED BY ALTERNATIVES 3 AND 4, IS EXPECTED TO MEET PERFORMANCE REQUIREMENTS FOR THE CONTAMINANTS PRESENT, PROVIDED THAT PROPER MAINTENANCE PROCEDURES ARE FOLLOWED. LONG-TERM MANAGEMENT FOR ANY OF THE ALTERNATIVES WOULD INCLUDE SERVICING OF THE ALTERNATIVE WATER SUPPLIES UNTIL ARARS ARE ATTAINED OR PUBLIC WATER IS INTRODUCED TO THE COMMUNITY. LONG-TERM MONITORING OF THE GROUND WATER WOULD BE REQUIRED UNTIL THE GROUND WATER CONTAMINANT LEVELS MEET ARARS.

#### RELIABILITY OF CONTROLS

FOR EACH ALTERNATIVE TO BE EFFECTIVE, CAREFUL MONITORING OF THE ALTERNATE WATER SUPPLIES IS REQUIRED UNTIL ARARS ARE MET IN THE AQUIFER OR UNTIL PUBLIC WATER SERVICE IS MADE AVAILABLE TO THE COMMUNITY. ALTERNATIVES 3 AND 4 REQUIRE OPERATION AND MAINTENANCE OF A WATER TREATMENT SYSTEM. OPERATIONAL COMPONENTS ARE NOT EXPECTED TO REQUIRE REPLACEMENT DURING IMPLEMENTATION OF THESE ALTERNATIVES.

#### REDUCTION OF TOXICITY, MOBILITY, OR VOLUME

THE EVALUATION OF THE REDUCTION IN TOXICITY MOBILITY OR VOLUME OF THE

CONTAMINANTS FOR EACH REMEDIAL ACTION INCLUDES CONSIDERATION OF 1) THE TREATMENT PROCESS AND REMEDY, 2) THE AMOUNT OF HAZARDOUS MATERIAL DESTROYED OR TREATED, 3) THE EXTENT OF REDUCTION IN TOXICITY, MOBILITY, OR VOLUME, 4) THE IRREVERSIBILITY OF THE TREATMENT, AND 5) THE TYPE AND QUANTITY OF TREATMENT RESIDUAL.

#### TREATMENT PROCESS AND REMEDY

AIR STRIPPING, AS REQUIRED BY ALTERNATIVES 3 AND 4, IS A DEMONSTRATED TECHNOLOGY THAT IS WELL-SUITED FOR REMOVING THE CONTAMINANTS OF CONCERN.

#### AMOUNT OF HAZARDOUS MATERIAL DESTROYED OR TREATED

THE AMOUNT OF HAZARDOUS MATERIALS DESTROYED OR TREATED VARIES ACCORDING TO THE ALTERNATIVE. ALTERNATIVE 2 WOULD NOT PROMOTE THE REDUCTION OF VOCs IN THE GROUND WATER AND ENTERING STREAM A EXCEPT BY NATURAL DEGRADATION AND FLUSHING OF THE VOCs IN THE AQUIFER. ALTERNATIVES 3 AND 4 INCLUDE, THE COLLECTION AND TREATMENT OF WATER FROM SPRING A-10. THE VOCs ARE CURRENTLY DISCHARGED FROM SPRING A-10 AT A RATE OF APPROXIMATELY 1 POUND/DAY; THIS RATE WOULD DECREASE WITH TIME AS THE VOCs IN THE AQUIFER DECREASE WITH TIME. LIKE ALTERNATIVE 2, ALTERNATIVE 3 WOULD NOT PROMOTE THE REDUCTION OF VOCs IN THE GROUND WATER EXCEPT BY NATURAL DEGRADATION AND FLUSHING. HOWEVER, ALTERNATIVE 4 WOULD INITIALLY PROVIDE THE EXTRACTION OF APPROXIMATELY 15 POUNDS/DAY OF VOCs. THIS MASS REMOVAL RATE WOULD DECREASE WITH TIME. THE REMAINDER OF LOW-LEVEL VOCs IN THE PLUME WOULD EVENTUALLY BE DEGRADED AND FLUSHED NATURALLY.

#### REDUCTION IN TOXICITY, MOBILITY, OR VOLUME

ALTERNATIVE 2 WOULD PROVIDE NO IMMEDIATE REDUCTION IN CONTAMINANT TOXICITY, MOBILITY, OR VOLUME IN THE GROUNDWATER OR SURFACE WATER. HOWEVER, NATURAL DEGRADATION AND FLUSHING WOULD GRADUALLY REDUCE THE MASS OF VOCs IN THE AQUIFER AND ENTERING STREAM A. ALTERNATIVES 3 AND 4 WOULD PROVIDE AN IMMEDIATE REDUCTION OF CONTAMINANTS ENTERING STREAM A FROM SPRING A-10. ALTERNATIVE 4 IS THE ONLY ALTERNATIVE THAT INCLUDES GROUND WATER EXTRACTION. THIS ACTION SHOULD POTENTIALLY RESULT IN A SIGNIFICANT REDUCTION OF VOCs IN THE AQUIFER BY THE EXTRACTION AND TREATMENT OF GROUND WATER. THE REMAINING VOCs WOULD ALSO BE NATURALLY DEGRADED AND FLUSHED FROM THE AQUIFER OVER A PERIOD OF TIME.

#### IRREVERSIBILITY OF TREATMENT

AIR STRIPPING, AS REQUIRED BY ALTERNATIVES 3 AND 4, PERMANENTLY REMOVES VOCs FROM GROUND AND SURFACE WATER.

#### TYPE AND QUANTITY OF TREATMENT RESIDUAL

FOR ALTERNATIVES REQUIRING TREATMENT, ALTERNATIVES 3 AND 4, INSIGNIFICANT AMOUNTS OF VOCs COULD BE PRESENT IN THE TREATED EFFLUENT.

#### TECHNICALLY FEASIBILITY OF IMPLEMENTATION

THE EVALUATION OF THE TECHNICAL FEASIBILITY OF IMPLEMENTING EACH REMEDIAL ACTION INCLUDES CONSIDERATION OF 1) THE ABILITY TO CONSTRUCT THE EQUIPMENT INCORPORATING THE TECHNOLOGY, 2) THE RELIABILITY OF THE TECHNOLOGY, 3) THE EASE OF UNDERTAKING ADDITIONAL REMEDIAL ACTION, IF NECESSARY, AND 4) MONITORING REQUIREMENTS.

#### ABILITY TO CONSTRUCT TECHNOLOGY

ALTERNATIVES 3 AND 4 WOULD INVOLVE CONSTRUCTION OF A COLLECTION SYSTEM FOR SPRING A-10, INCLUDING UP TO 1,000 FEET OF PIPELINE ACROSS ROLLING TERRAIN AND UNDER ROADS. ALTERNATIVE 4 WOULD REQUIRE THE INSTALLATION OF ANOTHER 3,000 FEET OF PIPELINE AND TEN WELLS FOR EXTRACTION AND TREATMENT OF GROUND WATER WELLS WOULD HAVE TO BE INSTALLED THROUGH 100 FEET OF SATURATED SOIL. THESE CONSTRUCTION ACTIVITIES MAY BE DIFFICULT,



BUT ARE TECHNICALLY FEASIBLE.

#### RELIABILITY OF TECHNOLOGY

AIR STRIPPING, AS REQUIRED BY ALTERNATIVES 3 AND 4, IS EXPECTED TO CONSISTENTLY MEET DISCHARGE REQUIREMENTS. THIS TECHNOLOGY IS A PROVEN TREATMENT METHOD FOR REMOVING ORGANIC CONTAMINANTS FROM A LIQUID WASTE STREAM OR CONTAMINATED WATER SUPPLY. TECHNICAL DIFFICULTIES ARE NOT FORESEEN.

#### EASE OF UNDERTAKING ADDITIONAL REMEDIAL ACTION

NO FUTURE REMEDIAL ACTIONS ARE ANTICIPATED FOR ANY OF THE ALTERNATIVES.

#### MONITORING REQUIREMENTS

A CONTINUING GROUND WATER MONITORING PROGRAM SHOULD SUFFICIENTLY DEFINE ANY CHANGES IN THE VOC PLUME, THUS ALLOWING THE PROTECTION OF THE AFFECTED RESIDENCES FOR EACH OF THE ALTERNATIVES. BECAUSE OF THE INSTALLATION OF SERIAL POINT OF USE CARBON UNITS, IT IS UNLIKELY THAT THE PUBLIC WOULD BE EXPOSED TO UNACCEPTABLE RISK DUE TO THE FAILURE OF A CARBON UNIT MONITORING PROGRAM. AN AIR STRIPPER EFFLUENT MONITORING PROGRAM MUST BE IMPLEMENTED FOR ALTERNATIVE 3 AND 4.

#### ADMINISTRATIVE FEASIBILITY OF IMPLEMENTATION

ALL OF THE REMEDIAL ALTERNATIVES WOULD REQUIRE THE CONTINUATION OF GROUND WATER MONITORING AND PLACEMENT OF RESTRICTIONS ON THE INSTALLATION OF NEW WELLS. IN ADDITION, ALTERNATIVES 3 AND 4 WOULD REQUIRE AN NPDES PERMIT FOR SURFACE WATER DISCHARGE. ALTERNATIVES 3 AND 4 WOULD REQUIRE PROPERTY EASEMENTS FOR INSTALLATION OF PIPELINES, WELLS, AND/OR A SURFACE WATER (SPRING A-10) COLLECTION DEVICE. ALTERNATIVE 4 REQUIRES THE EXTRACTION RANGE OF 144,000 TO 288,000 GPD OF GROUNDWATER, THUS REQUIRING A PERMIT FROM THE DELAWARE RIVER BASIN COMMISSION. THIS ALTERNATIVE MAY REQUIRE A DRILLING PERMIT FROM THE CHESTER COUNTY HEALTH DEPARTMENT.

#### AVAILABILITY OF SERVICES AND MATERIALS

THE EVALUATION OF THE AVAILABILITY OF SERVICES AND MATERIALS FOR IMPLEMENTING EACH REMEDIAL ACTION INCLUDES CONSIDERATION OF 1) THE AVAILABILITY OF TREATMENT, STORAGE CAPACITY, AND DISPOSAL SERVICES, 2) THE AVAILABILITY OF NECESSARY EQUIPMENT AND SPECIALISTS, AND 3) THE AVAILABILITY OF PROSPECTIVE TECHNOLOGIES.

#### AVAILABILITY OF TREATMENT STORAGE CAPACITY, AND DISPOSAL SERVICES

NONE OF THE ALTERNATIVES REQUIRE OFF-SITE TREATMENT STORAGE, OR DISPOSAL SERVICES.

#### AVAILABILITY OF NECESSARY EQUIPMENT AND SPECIALIST

THE EQUIPMENT REQUIRED FOR IMPLEMENTATION OF ALTERNATIVES 3 AND 4 WOULD BE READILY AVAILABLE. MINIMAL OPERATOR TRAINING WOULD BE REQUIRED FOR OPERATION AND MAINTENANCE OF AN AIR STRIPPER SYSTEM.

#### AVAILABILITY OF PROSPECTIVE TECHNOLOGIES

AIR STRIPPING SYSTEMS, AS REQUIRED FOR ALTERNATIVES 3 AND 4, ARE AVAILABLE AND WELL-DEMONSTRATED. SEVERAL VENDORS SUPPLY EACH TYPE OF EQUIPMENT REQUIRED FOR AIR STRIPPING.

#### COST

THE EVALUATION OF THE COST FOR IMPLEMENTING EACH REMEDIAL ACTION INCLUDES CONSIDERATION OF 1) THE PROBABLE CONSTRUCTION COST, 2) THE ANNUAL OPERATION AND MAINTENANCE COST, AND 3) THE PRESENT WORTH

ANALYSIS. A SUMMARY OF THE COST ANALYSIS FOLLOWS.

#### PROBABLE CONSTRUCTION COST

THE PROBABLE CONSTRUCTION COSTS FOR EACH OF THE ALTERNATIVES ARE AS FOLLOWS:

ALTERNATIVE 2:	\$	0
ALTERNATIVE 3:	\$	162,000, AND
ALTERNATIVE 4:	\$	656,000

#### ANNUAL OPERATION AND MAINTENANCE COST

THE ANNUAL OPERATION AND MAINTENANCE COSTS FOR IMPLEMENTATION OF EACH OF THE ALTERNATIVES ARE AS FOLLOWS:

ALTERNATIVE 2	\$	0
ALTERNATIVE 3:	\$	93,000, AND
ALTERNATIVE 4:	\$	175,000

THESE OPERATION AND MAINTENANCE COSTS DO NOT INCLUDE THE UNIVERSAL REQUIREMENT FOR GROUND WATER MONITORING AND MAINTENANCE OF ALTERNATIVE WATER SUPPLIES.

#### PRESENT WORTH ANALYSIS

THE PRESENT WORTH ANALYSES FOR EACH OF THE ALTERNATIVES, BASED UPON AN ANNUAL DISCOUNT RATE OF 8% ARE:

ALTERNATIVE 2:	\$	0
ALTERNATIVE 3:	\$	1.21 MILLION AND
ALTERNATIVE 4:	\$	2.63 MILLION

#### COMPLIANCE WITH ARARS

THE EVALUATION OF THE COMPLIANCE WITH ARARS FOR EACH REMEDIAL ACTION INCLUDES CONSIDERATION OF 1) CHEMICAL-SPECIFIC ARARS, 2) ACTION SPECIFIC ARARS, AND 3) LOCATION-SPECIFIC ARARS. ALSO, IF ARARS CANNOT BE ATTAINED BY THE REMEDIAL ACTION, APPROPRIATE WAIVERS JUSTIFYING THIS DEFICIENCY MUST BE CITED.

#### CHEMICAL-SPECIFIC ARARS

ARARS FOR SURFACE WATER ARE MET BY ALL OF THE ALTERNATIVES. HOWEVER, ARARS FOR GROUNDWATER WILL BE ATTAINED AFTER AS PERIOD OF TIME.

#### ACTION-SPECIFIC ARARS

THERE ARE NO ACTION-SPECIFIC ARARS FOR ALTERNATIVE 2. ALTERNATIVES 3 AND 4 MUST BE IN FULL COMPLIANCE WITH THE APPLICABLE PROVISIONS OF 25 PA. CODE SECTION 75.262, (GENERATORS OF HAZARDOUS WASTE) AND 75.264 (STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES). ALSO, EMISSIONS FROM AIR STRIPPING WOULD BE IN FULL COMPLIANCE WITH PENNSYLVANIA AIR TOXICS REGULATIONS (ALTERNATIVES 3 AND 4).

#### LOCATION-SPECIFIC ARARS

THERE ARE NO LOCATION-SPECIFIC ARARS APPLICABLE TO ANY OF THE REMEDIAL ALTERNATIVES.

#### APPROPRIATE WAIVERS

WAIVERS COULD BE REQUIRED FOR ALTERNATIVES 2 AND 3 TO JUSTIFY THE IMPLEMENTATION OF REMEDIAL ACTIONS THAT DO NOT DIRECTLY PROMOTE THE OVERALL ATTAINMENT OF ARARS IN THE GROUND WATER. APPROPRIATE WAIVERS FOR THE KIMBERTON SITE INCLUDE:

\* ARARS RELATING TO THE GROUND WATER ARE EXPECTED TO BE  
EVENTUALLY MET THROUGH NATURAL FLUSHING AND VOC DEGRADATION, AND

\* THE PUBLIC IS PRESENTLY NOT AT RISK; FUTURE RISK IS NOT EXPECTED.

#### OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

THE EVALUATION OF THE OVERALL PROTECTION OF HUMAN HEALTH AND THE  
ENVIRONMENT INCLUDES CONSIDERATION OF 1) THE METHODS TO ELIMINATE,  
REDUCE, OR CONTROL RISK, AND 2) THE METHOD TO PROTECT THE ENVIRONMENT.

#### METHODS TO ELIMINATE, REDUCE OR CONTROL RISKS

EACH OF THE ALTERNATIVES INCLUDE THE CONTINUED PROVISION OF ALTERNATE  
WATER SUPPLIES TO PROTECT THE PUBLIC HEALTH FROM CONTACT WITH  
CONTAMINATED GROUND WATER. THERE IS PRESENTLY NO SIGNIFICANT RISK  
(I.E., WELL BELOW EPA GUIDELINES) ASSOCIATED WITH SURFACE WATER.

#### METHODS TO PROTECT ENVIRONMENT

ALTERNATIVE 2 DOES NOT OFFER PROTECTION TO THE ENVIRONMENT.  
ALTERNATIVE 3 AND 4 PROTECT THE SURFACE WATER BY COLLECTION AND  
TREATMENT OF SPRING A-10. IN ADDITION, ALTERNATIVE 4 REQUIRES THE  
EXTRACTION OF GROUND WATER, WHICH WOULD HASTEN THE REDUCTION OF VOC  
CONCENTRATION AND MASS IN THE AQUIFER.

#### STATE ACCEPTANCE

EVALUATION OF THIS CRITERION IS REQUIRED FOLLOWING AGENCY REVIEW.

#### COMMUNITY ACCEPTANCE

EVALUATION OF THIS CRITERION IS REQUIRED FOLLOWING PUBLIC COMMENT.

#### SUMMARY OF DETAILED ANALYSIS OF ALTERNATIVES

A SUMMARY OF THE DETAILED ANALYSIS OF ALTERNATIVES IS PRESENTED IN  
TABLE 12.

#### IX. DOCUMENTATION OF SIGNIFICANT CHANGES

NO SIGNIFICANT CHANGES TO THE PREFERRED ALTERNATIVE PRESENTED IN THE  
PROPOSED PLAN HAVE OCCURRED.

#SRA

#### XII. SELECTED REMEDIAL ALTERNATIVE

##### A. EVALUATION CRITERIA

SECTION 121 OF SARA AND THE CURRENT VERSION OF THE NATIONAL CONTINGENCY  
PLAN (NCP) (50 FED REG. 47912, NOVEMBER 1985) ESTABLISH A VARIETY OF  
REQUIREMENTS PERTAINING TO REMEDIAL ACTIONS UNDER CERCLA. THE FOLLOWING  
NINE CRITERIA WERE USED IN THE EVALUATION OF THE REMEDIAL ACTION  
ALTERNATIVES AT KIMBERTON:

\* OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT REFERS TO  
WHETHER OR NOT A REMEDY PROVIDES ADEQUATE PROTECTION AND DESCRIBES  
HOW RISKS POSED THROUGH EACH PATHWAY ARE ELIMINATED, REDUCED OR  
CONTROLLED THROUGH TREATMENT, ENGINEERING CONTROLS, OR INSTITUTIONAL  
CONTROLS.

\* COMPLIANCE WITH ARARS ADDRESSES WHETHER OR NOT A REMEDY WILL MEET  
ALL OF THE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS OF  
OTHER FEDERAL AND STATE ENVIRONMENTAL STATUTES OR PROVIDES GROUND  
FOR INVOKING A WAIVER.

- \* LONG-TERM EFFECTIVENESS AND PERMANENCE REFERS TO THE ABILITY OF A REMEDY TO FURNISH RELIABLE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT AFTER CLEANUP GOALS HAVE BEEN MET.
- \* REDUCTION OF TOXICITY, MOBILITY OR VOLUME IS THE ANTICIPATED PERFORMANCE OF THE TREATMENT TECHNOLOGIES A REMEDY MAY EMPLOY.
- \* SHORT-TERM EFFECTIVENESS ADDRESSES THE PERIOD OF TIME NEEDED TO ACHIEVE PROTECTION, AND ANY ADVERSE IMPACTS ON HUMAN HEALTH AND THE ENVIRONMENT THAT MAY BE POSED DURING THE CONSTRUCTION AND IMPLEMENTATION PERIOD UNTIL CLEANUP GOAL ARE ACHIEVED.
- \* IMPLEMENTABILITY IS THE TECHNICAL AND ADMINISTRATIVE FEASIBILITY OF A REMEDY, INCLUDING THE AVAILABILITY OF MATERIALS AND SERVICES NEEDED TO IMPLEMENT A PARTICULAR OPTION.
- \* COST INCLUDES ESTIMATED CAPITAL AND OPERATION AND MAINTENANCE COSTS AND NET PRESENT WORTH COSTS.
- \* STATE ACCEPTANCE INDICATES WHETHER, BASED ON ITS REVIEW OF RI/FS AND PROPOSED PLAN, THE STATE CONCURS WITH, OPPOSES, OR HAS NO COMMENT ON THE PREFERRED ALTERNATIVE AT THE PRESENT TIME.
- \* COMMUNITY ACCEPTANCE WILL BE ASSESSED IN THE RECORD OF DECISION FOLLOWING A REVIEW OF THE PUBLIC COMMENTS RECEIVED ON THE ADMINISTRATIVE RECORD AND PROPOSED PLAN.

#### B. DETERMINATION OF PREFERRED REMEDIAL ALTERNATIVE

THE PREFERRED ALTERNATIVE IS ALTERNATIVE 4. ALTERNATIVE 4 (COLLECTION OF SPRING A-10 AND EXTRACTION AND TREATMENT OF GROUND WATER ON SITE), AS MORE FULLY DESCRIBED BELOW, IS RECOMMENDED AS THE MOST TECHNICALLY FEASIBLE, PRACTICAL, AND EFFECTIVE REMEDIAL ACTION FOR THE KIMBERTON SITE:

1. THE EXTRACTION WELLS PUMPING A TOTAL OF 100 GPM INITIALLY, WITH A CAPACITY TO PUMP A TOTAL OF 200 GPM, SHOULD BE INSTALLED FOR ON-SITE HYDRAULIC CONTROL AND GROUND WATER REMEDIATION. THE EXTRACTED GROUND WATER SHOULD BE TREATED IN AN AIR STRIPPING SYSTEM AND THEN DISCHARGED TO AN ADJACENT SURFACE WATER STREAM (STREAM A).  
  
THE CURRENT GOAL OF THE GROUNDWATER REMEDIATION IS TO ACHIEVE NATURAL BACKGROUND CONDITIONS. THIS GOAL WILL BE PERIODICALLY REASSESSED DURING REMEDIATION SYSTEM AND AQUIFER PERFORMANCE TO DETERMINE IF SUCH GOALS ARE FEASIBLE.
2. THE PRINCIPAL LOCAL GROUND WATER DISCHARGE POINT TO STREAM A (SPRING A-10) SHOULD BE COLLECTED AND TREATED BY AIR STRIPPING TO IMPROVE SURFACE WATER QUALITY.
3. THE GAC POINT OF USE TREATMENT SYSTEMS AND POTABLE WATER SUPPLY STORAGE TANKS WILL BE MAINTAINED UNTIL A PUBLIC WATER SUPPLY IS INSTALLED.
4. ADMINISTRATIVE CONTROLS TO PREVENT THE INSTALLATION OF NEW GROUND WATER EXTRACTION WELLS FOR USE WITHIN THE AREA AFFECTED BY GROUND WATER CONTAMINATION SHOULD BE IMPLEMENTED.
5. LONG-TERM GROUND WATER MONITORING IN CONJUNCTION WITH REMEDIAL ACTIVITIES SHOULD BE INSTITUTED TO FURTHER ASSESS CONTAMINANT PLUME CONFIGURATION AND DYNAMICS. DURING THIS TIME PERIOD THE PERFORMANCE OF THE STOCKTON FORMATION WILL BE FURTHER EVALUATED TO ASSESS THE VALIDITY OF THE ASSUMPTIONS GROUND WATER MODEL ASSUMPTIONS WHICH INVOLVE THE REMEDIATION OF THE STOCKTON FORMATION. IF THIS EVALUATION INDICATES THAT FURTHER GROUND WATER REMEDIATION IN THE STOCKTON FORMATION IS A VISIBLE ALTERNATIVE, THEN SUCH A PROGRAM MAY BE IMPLEMENTED FOR THAT AREA.

IMPLEMENTATION OF THESE RECOMMENDED REMEDIAL ACTIVITIES WILL MEET THE

OBJECTIVES OF CERCLA TO PROTECT HUMAN HEALTH AND THE ENVIRONMENT, TO BE COST EFFECTIVE, AND TO UTILIZE TREATMENT TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICAL.

THE PREFERRED ALTERNATIVE PROVIDES COMPLETE PROTECTION, IN THE SHORT-TERM, TO GROUNDWATER USERS BY TREATMENT OF THE WATER AT THE INDIVIDUAL WELLS. LONG-TERM EFFECTIVENESS WILL BE OBTAINED BY IMPLEMENTING THE PUMPING AND TREATMENT OF THE GROUNDWATER. THE RESPONSIBLE PARTIES IDENTIFIED AT THIS SITE WILL CONTINUE TO MAINTAIN CARBON FILTERS AND WATER VIA BELOW GRADE TANKS WHICH PROVIDE BOTH DRINKING AND CONTACT WATER AND, WHICH UPON CHEMICAL ANALYSIS ACHIEVES THE CURRENT GUIDELINES OF BACKGROUND.

EPA, IN CONSULTATION WITH PADER, HAS MADE A PRELIMINARY DETERMINATION THAT THE PREFERRED ALTERNATIVE PROVIDES THE BEST OVERALL COMPLIANCE WITH RESPECT TO THE NINE CRITERIA. THE PREFERRED ALTERNATIVE IS ANTICIPATED TO MEET THE FOLLOWING STATUTORY REQUIREMENTS TO:

- \* PROTECT HUMAN HEALTH AND THE ENVIRONMENT
- \* MEET ARARS
- \* BE COST-EFFECTIVE
- \* UTILIZE PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT (OR RESOURCE RECOVERY) TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE.

IN SUMMARY, AT THIS TIME THE PREFERRED ALTERNATIVE IS BELIEVED TO PROVIDE THE BEST OVERALL COMPLIANCE AMONG THE ALTERNATIVES WITH RESPECT TO THE CRITERIA USED TO EVALUATE REMEDIES. BASED ON THE INFORMATION AVAILABLE AT THIS TIME, THEREFORE, EPA AND PADER BELIEVE THE PREFERRED ALTERNATIVE WOULD BE PROTECTIVE, WOULD MEET ARARS, WOULD BE COST-EFFECTIVE, AND WOULD UTILIZE PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES OR RESOURCE RECOVERY TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE. THIS ALTERNATIVE MEETS THE GOAL OF PROTECTING HUMAN HEALTH AND THE ENVIRONMENT AND RESTORING THE CONTAMINATED GROUNDWATER TO A CLEAN AND UNCONTAMINATED CONDITION.

#### SCHEDULE

REMEDIAL DESIGN AND CONSTRUCTION FOR THE FINAL REMEDY IS ANTICIPATED TO COMMENCE IN SPRING 1990.

#### C. STATEMENT OF FINDINGS REGARDING WETLANDS AND FLOODPLAINS

THIS DECISION PROVIDES A REMEDIAL ALTERNATIVE FOR TREATMENT OF CONTAMINATED GROUNDWATER, DEFINED AS THE FINAL REMEDIAL ACTION FOR THIS SITE. HOWEVER, THE DESIGN REPORT WILL CONSIDER THE IMPACT OF CONTAMINATION ON WETLANDS FLOODPLAINS AND SURFACE WATER.

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#### XIII. THE STATUTORY DETERMINATIONS

##### A. PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

THE SELECTED REMEDY WILL REDUCE AND CONTROL THE AMOUNT OF GROUND WATER CONTAMINATION, WHICH WILL ENSURE ADEQUATE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT. NO UNACCEPTABLE SHORT AND LONG-TERM RISKS WILL BE CAUSED BY IMPLEMENTATION OF THE REMEDY.

BASED ON A REVIEW OF VOLATILE ORGANIC CHEMICAL ANALYTICAL DATA FROM COLLECTED GROUNDWATER SAMPLES FROM AFFECTED OFF-SITE WELLS, AND IN VIEW OF THE VINYL CHLORIDE CONCENTRATIONS IN THE UNTREATED GROUNDWATER, THE USE OF GRANULAR ACTIVATED CARBON FILTERS HAS PROVEN TO BE SUCCESSFUL IN REDUCING THE CONCENTRATIONS OF THE CONTAMINANTS OF CONCERN, (I.E. TCE, DCE, VC) TO NON-DETECTABLE LEVELS.

##### B. ATTAINMENT OF ARARS

THE SELECTED REMEDY WILL ATTAIN THE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS AND ARE AS FOLLOWS:

FEDERAL

SAFE DRINKING WATER ACT - MCLS

CLEAN WATER ACT - AMBIENT WATER QUALITY CRITERIA

CLEAN AIR ACT, PART D  
NATIONAL AMBIENT AIR QUALITY STANDARDS

STATE

PENNSYLVANIA CLEAN  
STREAMS LAW - SECTION 402 - AMBIENT WATER QUALITY STANDARDS

PENNSYLVANIA RULES AND  
REGULATIONS  
TITLE 25 CHAPTER 93

PENNSYLVANIA SCENIC RIVERS ACT

FRENCH CREEK STATE PARK SCENIC RIVERS ACT

PENNSYLVANIA AIR RESOURCE REGULATIONS

PENNSYLVANIA AIR TOXIC GUIDELINES

ADDITIONAL REQUIREMENTS FOR PROTECTIVENESS

THE SELECTED SITE REMEDY IS CONSISTENT WITH THE FOLLOWING:

FEDERAL EXECUTIVE ORDER 11988 - ACTION TO AVOID ADVERSE  
FLOODPLAIN MANAGEMENT 40 CFR EFFECTS, MINIMIZE POTENTIAL  
PART 6, APPENDIX A. HARM, RESTORE AND PRESERVE  
NATURAL BENEFICIAL VALUE.

FEDERAL EXECUTIVE ORDER 11990 - ACTION TO MINIMIZE  
PROTECTION OF WETLANDS, 40 CFR DESTRUCTION, LOSS, OR  
PART 6 APPENDIX A. DEGRADATION OF WETLANDS.

FEDERAL CLEAN WATER ACT - DIFFERENTIAL GROUNDWATER  
POLICY CLASS IIA AQUIFER

PENNSYLVANIA SCENIC RIVERS ACT  
FRENCH CREEK STATE PARK SCENIC  
RIVER ACT  
PENNSYLVANIA AIR RESOURCE REGULATIONS  
PENNSYLVANIA AIR TOXIC GUIDELINES.

NEW JERSEY COASTAL PLAIN - ACTION TO MINIMIZE AQUIFER  
SOLE SOURCE AQUIFER IMPACTS

C. COST EFFECTIVENESS

THE SELECTED REMEDY IS COST EFFECTIVE WITH RESPECT. THE PRPS ARE OPERATING THE CURRENT SYSTEMS DESCRIBED IN THE SELECTED REMEDIAL ALTERNATIVE IN COMPLIANCE WITH THE PADER CONSENT ORDER AND AGREEMENT.

D. UTILIZATION OF PERMANENT SOLUTIONS EMPLOYING ALTERNATIVE TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

THE SELECTED REMEDY IS THE MOST APPROPRIATE SOLUTION FOR THIS OPERABLE UNIT AND REPRESENTS THE MAXIMUM EXTENT TO WHICH PERMANENT SOLUTIONS AND TREATMENT CAN BE PRACTICABLY UTILIZED.

E. PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

THE PREFERENCE IS SATISFIED SINCE TREATMENT IS THE PRINCIPAL ELEMENT OF  
THE CHOSEN ALTERNATIVE.

## RESPONSIVENESS SUMMARY

### I. INTRODUCTION

THE KIMBERTON SITE OCCUPIES APPROXIMATELY ONE ACRE AND IS LOCATED IN THE NORTHEASTERN PORTION OF CHESTER COUNTY IN THE VILLAGE OF KIMBERTON. DOMESTIC AND COMMERCIAL WELL WATER SAMPLES HAVE DETECTED HIGH LEVELS OF CHLORINATED HYDROCARBON CHEMICAL CONTAMINATION. A SOURCE OF THIS CONTAMINATION HAS BEEN IDENTIFIED AS THE PROPERTY CURRENTLY OWNED BY THE MONSEY CORPORATION WHICH CONTAINED SEVERAL BURIED LAGOONS THAT WERE OPERATED BY CIBA-GEIGY CORPORATION DURING THE 1950'S. AN INVESTIGATION OF THE SITE AND FURTHER SAMPLING STUDIES HAVE REVEALED THE PRESENCE OF ASSORTED VOLATILE ORGANIC COMPOUNDS. THE KIMBERTON SITE WAS ADDED TO THE SUPERFUND NATIONAL PRIORITIES LIST (NPL) IN 1982.

### II. SUMMARY OF COMMUNITY RELATIONS ACTIVITIES

A NUMBER OF PUBLIC MEETINGS WERE CONDUCTED DURING 1981-82 BY THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES AND EPA TO DISCUSS THE RESULTS OF PRELIMINARY WATER SAMPLING AND THE POSSIBLE CLEANUP ACTIONS THAT MAY BE TAKEN. IN COOPERATION WITH PADER, CIBA-GEIGY AND MONSEY PRODUCTS, INC. CONDUCTED ADDITIONAL PUBLIC MEETINGS AND PROVIDED BRIEFINGS TO LOCAL OFFICIALS TO INFORM THEM OF THE SITE INVESTIGATION RESULTS. IN 1985, BOTH COMPANIES ESTABLISHED INTERIM WATER SUPPLIES FOR 23 FAMILIES AND ALSO PROVIDED CARBON ADSORPTION SYSTEMS. IN AUGUST OF 1988, PADER AND EPA NOTIFIED AREA RESIDENTS THAT THE PROPOSED REMEDIAL ACTION PLAN FOR OPERABLE UNIT I WAS AVAILABLE FOR REVIEW/COMMENT BY PLACING AN ADVERTISEMENT IN THE AUGUST 26, 1988 EDITION OF THE CHESTER COUNTY DAILY LOCAL NEWS. IN ADDITION, THE PROPOSED PLAN WAS MAILED TO ALL CITIZENS IN THE AREA WHOSE NAME WERE ON THE SITE MAILING LIST. A PUBLIC MEETING TO DISCUSS THE PROPOSED REMEDIAL ACTION PLAN WAS ALSO OFFERED TO AREA RESIDENTS. HOWEVER, REQUESTS FOR SUCH A MEETING WERE NEVER RECEIVED.

OPERABLE UNIT II PROPOSED REMEDIAL ALTERNATIVE FOCUSED ON GROUND WATER REMEDIATION AT THE KIMBERTON SITE. IN MAY OF 1989, PADER AND EPA NOTIFIED AREA RESIDENTS THAT THE PROPOSED REMEDIAL ACTION PLAN WAS AVAILABLE FOR REVIEW/COMMENT BY PLACING AN ADVERTISEMENT IN THE MAY 21, 1989 EDITION OF THE READING EAGLE TIMES. A PUBLIC MEETING TO DISCUSS THE PROPOSED REMEDIAL ACTION PLAN WAS ALSO OFFERED TO AREA RESIDENTS. HOWEVER, REQUESTS FOR SUCH A MEETING WERE NEVER RECEIVED.

### III. WRITTEN COMMENTS

NEITHER PADER NOR EPA RECEIVED WRITTEN NOR VERBAL COMMENTS ON EITHER PROPOSED REMEDIAL ACTION PLAN FOR THE KIMBERTON SUPERFUND SITE.